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# The Farmer's Digest


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Business Manager—A. E. Heick

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New Jersey Agricultural Experiment Station

M. L. Wilson
Director of Extension Work
United States Department of Agriculture



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The Farmer's Digest

Volume 5 January, 1942 Number 9

# Principles of Successful Farm Organization

Condensed from The Nebraska Farmer

*Frank Miller and Walter Ruden*

ANALYSIS of southeastern Nebraska farm records for 1940 shows that size of business and efficiency in operating it are important factors in determining net income. Returns per man on 280-acre farms averaged more than three times the amount received per worker on small farms. Efficiently managed farms returned more than twice as much per worker as inefficiently managed units of the same size.

These facts suggest that a successful farm business is the result of a combination of good management and adequate equipment on a farm unit which is large enough to provide a satisfactory income. Attaining financial success is a problem of keeping receipts high and expenses correspondingly low. Frequent changes in plans for operating the farm are necessary. To the able manager it is a game without definite rules, but there are some basic principles that may serve as guides.

Three of these principles are of primary importance. (1) The modern farmer who produces agricultural commodities for the market must use labor - saving machinery. (2) The business should be large enough to keep management, labor and equipment employed at their total or seasonal capacity. (3) Efficient management is essential if the business is to return a satisfactory income.

Modern farming is a form of mechanized production. Tractors and four to six-horse teams have become standard power units. Gang plows, two-row listers, multiple row cultivators, and many other machines of similar size are essential companion equipment. By using these labor-saving machines the farmer is able to produce agricultural commodities in large volume and at low cost.

Any type of machine production requires careful organization. There must be a proper balance between management, labor, equipment, and size of operating

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unit. At the present time many of our farms are too small. These inadequate units result in high production costs and low net returns. Records from a county in southeastern Nebraska may be used to illustrate the influence of proper combination of the factors of production on net farm income.

In 1940 records from this county included 22 farms averaging 280 acres in size and 31 operating units of 145 acres. Both groups were one-man farms on which some help was hired during rush seasons. The average investment in machinery was $1,900 on the large farms and $1,000 on the 145-acre group. Each man on the large farms took care of 124 crop acres and 22 units of productive livestock. On the small farms each man cultivated and harvested only 75 acres and looked after 12 units of productive livestock. The power, machinery, and labor cost on the large farms was $5.70 per crop acre which was a saving of $1.30 an acre if compared with the cost on the small farms. Wheat yields on the large farms averaged 27 bushels per acre and feed crops, including corn, 24 feed units. Corresponding yields on the small farm were 23 bushels for wheat and 19 feed units for other crops. Returns from cattle, which were the principal kind of productive livestock, were $217 for each $100 worth of feed consumed on the 280-acre farms. Operators of the small farms got $187 for each $100 worth of feed. Gross receipts on the large farms averaged $3,200. Expenses were $1,400, leaving a farm income of $1,800 to pay family living expenses and interest on the investment if the farm was operated by an owner or rent if it was operated by a tenant. The average net farm income on the small units was only $800. The returns per man employed on the large farms averaged $860, compared with $240 on the small farms.

These are typical results. The returns on the 145-acre farms were disappointing because of the small size of the business. If markets are available for products such as fluid milk, fresh eggs, dressed poultry, and vegetables, a satisfactory size of business may be set up on a few acres. As a rule a part of the income on these small units is derived from services in processing and delivering products to consumers. The returns to the small farm are likely to be low unless the volume of business can be increased by turning a part of the time of the operator into income through these services.

Efficiency is important in any type of farm business. The income from well-equipped operating units that are satisfactory in size may be disappointing if they are not well managed. Data in Table 1 show how efficiency in

the use of labor, in keeping important production costs low, and in managing cattle so as to get high returns for the feed used affected incomes on farms of similar size.

Labor efficiency is measured by calculating the number of days of productive work each man accomplishes during the year. The average for the group of 43 farms was 182 days. Each man on the farms with the highest efficiency accomplished an average of 228 days of productive work during the year.

Power, machinery and labor costs are among the most important expenses on the farm. High costs in these items indicate low efficiency. The average cost per crop acre on the forty-three farms was $6.80. The least efficient operators had expenses averaging $7.90 and the most efficient $5.50. The value of all family labor was included in these calculations.

Efficiency in feeding and managing cattle is indicated by the returns for each $100 worth of feed consumed by this kind of livestock. The average was $234. The eight farm operators who were below average in all three efficiency factors received $132. The seven with the highest efficiency received $325.

Many other factors affect farm income but the three which have been pointed out are sufficient to show that efficiency pays. The net income to the business on the eight farms that were below average in all three factors was $800. Returns to each man who worked on these farms averaged $360. With the size of the business remaining constant, the net farm income of each group increased with improved efficiency in each of the factors. The seven farm operators who were above average in all three factors received an average of $1,200 after paying business expenses. Returns per man were $740.

Under the American system of private ownership of land, farms are transferred from one generation to the next by inheritance or purchase. As a rule it is necessary for the man who becomes an owner-operator to pay for at least a part of his farm. He may begin as a tenant and climb the ladder to ownership. If this is to be accomplished, efficient management is essential. The successful operator must bring together labor-saving equipment and units of land in such combinations as to get high returns at low proportionate costs. The net income must be large enough to meet ordinary family needs and permit the accumulation of savings. A farm on which an efficient operator can earn a satisfactory living for his family and pay for the land is necessarily larger than a subsistance unit.

# Generous Feeding Is Wise Feeding When Prices Are at Present Levels

**Condensed from The Farmer**

WHEN prices of dairy and poultry products and of pork are at present levels the wise procedure, records show, is to feed heavily. Put every animal and bird on a speeded-up production schedule just as any other manufacturer makes his plant work harder and faster in times of relatively good prices. Of course, it is always sound business to search out the best feed bargains, but caution unwisely directed in the search for the cheapest possible feed, leads now, much more than in times of low prices, to the least possible profit. Let's see how this applies to the *hog business* first, then to dairy, poultry and beef.

Chief concern among better *hog feeders* just now is the increased price of tankage. Tankage prices have moved up to high levels, but even though they have, no feeder, says W. H. Peters, head of the animal husbandry department at University Farm, can afford not to put tankage in the ration for pigs weighing less than 100 pounds. Over 100 pounds comes the point where some are questioning tankage this year, but what many of the better feeders are saying may be summed up this way: "If I don't feed a high protein supplement my pigs are going to hit the market late, and when there are as many hogs as there are this year, I'm taking no chances on that."

It is figured that a half pound of tankage replaces two pounds of corn, and that for a pound of gain on the very best feeder pigs 2½ pounds of corn and one-half pound of tankage are required. The vast majority of feeders won't get gains that cheaply.

At the Morris Experiment Station where quite a large herd of Poland Chinas are being maintained an extremely careful check is kept on production costs. Each pig in each litter is weighed at farrowing, at 21 days, then at 56 days, and after that every 28 days until they reach 200 pounds. Nearly all the pigs of the fine breeding in this herd weigh 200 pounds before they are 180 days old, and only pigs that reach that weight before they are 168 days old are kept for breeding purposes. All others are marketed. Even with this careful program designed to produce pigs that gain rapidly on comparatively lit-

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tle feed the average for all in the herd last year was a pound of gain to 3.27 pounds of feed. The pigs in one litter put on gain at a little less than the three to one-ratio, but all the others required three pounds or more.

The protein mixture used at the Morris Station is equal parts soybean meal or linseed oil meal during the summer months, and two parts tankage to one part soybean meal and one part alfalfa leaf meal through the winter. Corn is cracked and the concentrate mixed with it, then fed in open feeders. From weaning to 112 days of age the pigs get a mixture of 80% corn and 20% of the protein concentrate. From 112 days to 140 days they get 85% corn and 15% concentrate, and after that, 88% corn and 12% concentrate.

It has become necessary to look beyond the farm for protein concentrate in some cases, due to the fact that many farmers are now selling whole milk to creameries rather than cream. The price of dry skimmilk is high because so much is being shipped abroad, and, because the price is high, creameries with dryers can afford to pay considerably more for butterfat in whole milk than they normally pay. If, however, skimmilk is available a half gallon of skimmilk per day per pig if pigs are not over 50 pounds in weight will provide the needed protein and tankage doesn't have to be fed. The amount of skim should be increased as the weight increases to a gallon per day for pigs 100 pounds and over. However, if pigs are fed skimmilk or buttermilk in place of the other high protein supplements they have greater need for a mineral mixture than if fed tankage.

But whether it is skimmilk or tankage or such vegetable protein concentrates as soybean meal or linseed meal mixed with tankage that are found to be cheapest on a given farm, these general rules apply in any case: No producer can afford to feed corn alone to pigs under 100 pounds even though protein supplement prices go even higher than they are, and no producer can afford to market pigs that are not in top market condition.

Farm management specialists at University Farm, St. Paul, have records covering 1,400 dairy herd years. Put another way, they cover 140 herds over a 10-year period. Take the period from 1928 through 1937 as an example. They averaged the production for all the cows on record, and then they set out to learn what part feeding had played in making this record. They found that herds fed a ration containing 9% protein produced 13% less butterfat than the average. In other words, for every 100 pounds of butterfat the average cow produced these un-

derfed cows produced 87 pounds. On the other hand the cows that were fed a ration containing a little more than 16% protein produced 8% more than the average, or 21% more than the underfed cows.

*Analyses* of records for 1940 show also what good feeding means to the pocketbook. These cover 126 farms in Southeastern Minnesota. The record analysts found that the average return per cow above feed costs was $58.05 that year, while on the 25 farms highest in returns above feed costs the average was $90.71 per cow, and on the 25 lowest in returns above feed cost the average was $27.12 per cow. The average cow of these 126 herds got 88 pounds of commercial feeds under 25% protein and 88 pounds containing more than 25% protein. Those in the herds which earned $90.71 per cow got 130 pounds under 25% protein and 143 pounds over 25% protein. The low producers, those that paid only $27.12 above feed costs, got only 35 pounds of the former and 70 pounds of the latter. The higher protein feeds were the oil meals such as soybean and linseed oil meal, while the lower protein feeds were mill products such as bran and shorts.

What combination of feed ingredients will provide the 16% ration proved by the 1,400 dairy herd years to be most productive? It is simple. Good quality alfalfa hay fed in such quantities as the cattle will eat together with a mixure of equal parts corn, oats and barley. If alfalfa hay is of poor quality as a great deal of it is this year, a high protein feed is needed to supplement the home grown grains. Barley, oats, wheat bran and linseed meal in equal quantities makes a 24% protein mixture and will offset the low protein content of poor quality alfalfa hay or grass hay.

In addition to earning extra profits, a change from a poor ration to a good one on many farms may lead to interesting discoveries as to the productive ability of some individual cows. It will go far toward showing which cows are paying their way, and which are not.

*And now about chickens.* On October 27, 1941, according to figures compiled by Dr. H. J. Sloan, chief of the Poultry Department at University Farm, feed prices for a typical laying ration had increased 35.9% over a year ago, but egg prices had increased 47½%. The ration on which these figures are based consists of a mash made up of 27 parts corn, 10 parts bran, 20 parts middlings, 16 parts oats, 5 parts alfalfa leaf meal, 10 parts meat scrap, 5 parts soybean oil meal, 5 parts dry skimmilk, 1 part salt and ½ part fish oil. Ingredients which have increased

the most in price and the percentage of their price increase are dried skimmilk, 58%; soybean meal, 63%; meat scrap, 70%, and linseed oilmeal, 69%.

It was presumed in arriving at the average of 35.9% feed cost increase figures given above that the birds would eat equal parts grain and mash, and that the grain mixture would consist of three parts corn and one part whole oats.

But what happens when a flock owner tries to cheapen the ration —when he takes out, let's say, all the animal protein such as meat scrap, milk, etc., and in its place feeds vegetable protein only—the kind that is contained in soybean oil meal, linseed oil meal and cottonseed meal? Poultry specialists at Washington State Experiment Station set out to learn the answer to that question. They selected birds of like quality, and separated them into several lots. To one lot they fed a ration containing 12% to 13% vegetable protein, and the average production of that lot was 139 eggs at a feed cost of 10.4c per dozen. To another lot they fed a ration containing 14% animal protein, and this lot produced 161 eggs per bird at an average feed cost of 8.8c per dozen. A third lot got a 15% animal protein ration and the average per bird production was 163 eggs at 8.6c per dozen. The above ration contains 15% protein, and although there are some vegetable protein concentrates included in its ingredients, it nevertheless contains enough of the animal proteins to be a well balanced ration.

As further proof that well fed, well bred birds are most profitable there are the records compiled by Miss Cora Cooke, Minnesota extension poultry specialist, for the 10-year period of 1926 through 1935. The feed cost per hen for the 183 high producing flocks was $2.18, for the medium producing flocks, $1.83, and for the low producing flocks, $1.45. If cheap feeding is profitable, it should show up as a fact here, but it doesn't. The flocks with the highest feed cost returned a profit above feed costs of $2.23 per bird, those in the medium feed cost range, $1.30, and the low feed cost birds only 71 cents per bird, just about a third as much as those that were well fed.

What applies to pigs with reference to market condition also applies to cattle. The spread between lean, unfinished cattle and fat, well-finished cattle is too great to make it profitable to put the former kind on the market.

Favorable market times, remember, are times to turn feed into meat, butter and eggs, and to get as much as possible of these products on the market while prices remain favorable.

# Ten Bull Battery

**Condensed from The Jersey Bulletin**

CUSTOM bull service, with the bull taken to the cow instead of vice versa, was the idea that flashed on Seth Eads back in 1934. He needed a job or a business of some kind. So he originated one that was brand new.

Last year the 10 Eads' Jersey bulls served nearly 1,500 cows all the way from Apache Junction on the east to Avondale on the west, and up to Beardsley on the northwest. Seth has a prosperous business, although it's one that keeps him on the hop at inconvenient hours and keeps his wife tied close to a telephone.

Seth Eads came to Arizona, in 1932, for his health. He had been a farm boy in Indiana, milked shorthorns for his dad, and sort of got fine dairy stock into his blood.

He traded cows off and on for a couple of years after coming to Salt River Valley. He got his health back, and an ambition to find some occupation that would enable him and his family to live here permanently. In casting around, he was struck by the number of family cows, especially Jerseys, and the breeding difficulties of their owners. So the great idea was born.

The Eads went back to Indiana in the summer of 1934. When they returned they brought two purebred Jersey sires, bought from a famous farm where Mrs. Eads' brother happened to be herdsman. And the "Eads' Bull Service" was born.

But the business didn't develop just the way he figured it would. It developed a whole lot better. His calls, most of them, came not from owners of family cows but from owners of small herds. Many of these found that it was cheaper and easier to depend on Eads than to keep sires. Today some of his best customers have as many as 20 cows. The one-cow folks aren't neglected, but they provide only a small part of his revenue.

In one year, 1937, Eads also kept Guernsey bulls. Then a competitor entered the Guernsey field and Eads left it. The other fellow quit pretty soon, but Eads decided to stick with the Jersey breed. If he has two kinds of bulls he has to hire help and that eats up a lot of profit. Besides, a majority of the small herds in the neighborhood are Jerseys.

Nearly all calls come before 9 A.M. or after 5 P.M. Mr. and Mrs. Eads can never be out of

**Reprinted by permission from the Jersey Bulletin, Indianapolis, Indiana, July 30, 1941**

hearing of the telephone bell at the same time, unless she can find a substitute to trust.

When a call comes, Eads loads two of his bulls into a double-compartment trailer and is away. He always takes two and telephones home as soon as he has finished at one place. Another call may have come in, and then he can complete two services on one trip.

For one service he charges $2.50 within a 10-mile radius. Outside that area he adds five cents a mile. One return service is given free if necessary; for each after that, it's $1.

Naturally a novel enterprise like this, which grew from two bulls to ten and to almost 1,500 services annually in six years, has attracted attention. Imitators, too. Eads thinks there are about six bull services over the country, operated along the same lines as his own. Largest is probably one at Sexton, Mo., launched by a man who was here and looked over Eads layout. He keeps bulls of all four principal dairy breeds.

Ivan Loughary became enthusiastic over the bull-to-cow plan while he was western fieldman for the American Jersey Cattle Club. He quit to become extension dairy specialist in Idaho, where he is promoting bull services on a co-operative basis. One member of a group keeps the bulls and trailer and the others pay him for his feed and trouble.

## Stone Garden Frames

The frame garden no longer is on trial in Texas. In San Saba county, where these covered gardens supply fresh vegetables and greens every month of the year, farm families, according to Frances Punchard, home demonstration agent, have resorted to permanent construction and are laying up tight masonry walls with ventilation openings at the ends. Native stone joined with concrete was used at the Grover Locker farm for a garden 40 feet long and 6 feet wide. Similar construction was used for one 20 feet long and 5 feet wide at Alonzo Park's farm. Both have subirrigated lines made of tin cans. Quart cans in which lubricating oil has been sealed were used because they are finished with an enamel that gives them longer life.

Ends cut from the cans are bent to semi-circular shape and are placed over joints between cans to keep soil from sifting through to fill the line. One end of each can that finishes a line is left intact. Elbows are made by cutting a hole in the side of one can, then shaping the end of another to fit down, saddle-like, over it.

*—Capper's Farmer*

# You Can Ventilate That Stable

**Condensed from Electricity on the Farm**

***Ralph J. Bugbee***

IT'S against all the rules and regulations, but it works. After all is said and done, "it works" is what we want when we install a system of ventilation.

The idea that a stable can be greatly improved without the expense of insulation, without the construction of intake flues and other gadgets to control the flow of air, just doesn't fit into the old picture. To say further that a complete two-speed automatic electric ventilating system can be carried by one man from his car and be installed and operating in a couple of hours;—and have this one unit adaptable to the needs of a small herd or a large one is heresy. To have such a system cost only about $75 may be too much to believe.

But it's being done in Vermont, and if you will come to Vermont you can talk with farmers who have had two and three years of satisfactory experience with this type of ventilation.

Personally I know very little about ventilation and I tell our farmers so when an installation is being made. I tell them frankly that I don't know exactly where the best fan location in the stable will be and that I want the privilege of changing its location after observation for a few days. Yes, it can be moved to different parts of the stable without having to rebuild the barn. However, to date all of the units are where they were first located.

Vermont is rather chilly at times, and a few years ago I got to thinking about the steaming air that tumbled out of stable doors on cold mornings, of windows dripping water and frames rotting, of walls wet and clammy, and of air thick and foul. Farmers didn't like that sort of thing, and so far as I have been able to learn, neither did the cows; but farmers just didn't have the money necessary to install expensive equipment to correct the condition. I was intrigued by the problem, and soon my cellar workshop began to hum.

In the first place, I reasoned that a stable was a box surrounded on all sides by an atmospheric pressure of about 15 pounds per square inch. Now, if I take air out of the box at a rapid rate, I am creating a partial vacuum in the box which the outside pressure will try to overcome. If my

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box barn were absolutely tight and I continued to pump out the inside air, it would soon collapse from the outside pressure. Fortunately, Vermont barns are not tight and always there are cracks around the windows and doors, in the walls, in the ceiling, and even the cat hole does its part. Now, if these sources of air penetration are already there, why not use them? They are not an additional expense. Some of them may want to be adjusted to do greater duty and some to do less, but always remember that outside air is going to come in even if you create a *small* vacuum. My observation is that air comes in through natural leaks in such a way that it is quite evenly distributed. The air in a stable should be changed six times per hour if the cubical content of the stable is about 600 cubic feet per 1000 pounds of animal. Another rule is that every 1000 pounds of animal should get 60 cubic feet of air per minute. The ideal stable temperature to maintain is 50 to 55 degrees. It has also been determined that an average cow will give off in her breath from 1½ to 2 gallons of water per day, which is enough to make a depth of better than an eighth of an inch over the area of her stall. The average humidity should be around 65%.

To correct the bad condition in any given stable and comply with the requirements of the foregoing rules, it is necessary to have a formula by which the necessary volume of air movement can be determined and then select a fan to give that volume. Bearing all these rules in mind, we come to the following which for all practical purposes is accurate enough:

$$\frac{\text{Cu. ft. in stable} \times 6 \text{ (changes per hr.)}}{60 \text{ (min. in hr.)}} = \text{cu. ft. per min. for fan}$$

On studying this formula, I found it could be simplified as follows:

$$\frac{\text{Cu. ft. in stable}}{10} = \text{Fan capacity in cu. ft. per min.}$$

From this it is evident that a stable 28 x 40 ft. and 8 ft. high with 8960 cubic feet of space will need a fan that will deliver 896 cubic feet of air per minute to give six changes of air per hour.

Let's check this rule another way. This stable should house 15 cows at the rate of 600 cubic feet of air space to a cow. Fifteen cows at 60 cubic feet of air per minute is 900 cubic feet for the stable or within 4 cubic feet of the result of our first rule.

You see, even the rule to use with this ventilating system is simple.

Here in Vermont we have both large and small stables and so I

reasoned why not get a large enough fan and drive it with a multiple step V pulley so that the speed could be changed to meet varying conditions and the increasing size of herds. It is a known characteristic of a fan that it's air delivery varies about in direct proportion to its speed. So why not put in a ¼ horsepower motor—large enough to handle the big jobs; then the little ones will be easy. That won't be wasteful of money or electricity because there is only about $3.00 difference in the price of the various two-speed motors up to ¼ horsepower, and because it is a characteristic of a motor to use current only in proportion to the load it is carrying. Then let's put on a switch with thermostat control and a double throw so that with a two-speed motor the fan will operate at full speed above a given temperature and below that at half speed. All of the equipment and material used is standard make and readily available.

By using a 4-step V pulley on the fan arbor, a wide range of fan speeds is available. An overload switch which opens both sides of the electric circuit is an essential safety feature.

The outtake fan unit is made of ½ inch and ⅜ inch plywood and is 22 inches square outside with a 20 inch bucket type fan. This size was decided upon because most stable windows where the fans are placed, have 22-inch casings or larger and because one 20-inch fan will handle most stables. I have found this type of fan to be quiet: it does not load up excessively with dust, and is inexpensive. At 1140 RPM, this fan delivers 2920 cubic feet of air per minute which is sufficient to handle a stable with about 60 cows, bulls, and young stock. (For easy figuring, I count the bulls and calves. Two calves equal one cow.) In the following table it is easy to see that a wide range of applications can be had from this one unit.

**Fan Speed Ratings**

| | | | |
|---|---|---|---|
| Motor Pulley | 1¾" | 1¾" | 1¾" |
| Fan Arbor Pulley | 4" | 3¼" | 2½" |
| Full speed RPM | 754 | 930 | 1200 |
| Full speed CFM | 1965 | 2400 | 3000 |
| Half speed RPM | 377 | 465 | 600 |
| Half speed CFM | 982 | 1200 | 1500 |

It is easy to change the belt from one pulley groove to another because the motor is on a sliding or hinged base. Apparently plywood is standing up all right after three years as a duct material. Nobody knows how long the fan and motor will last, but with proper care, it should be many years.

The two-speed feature in the thermostat is most desirable. Under this system when the stable temperature gets above the nor-

mal 50 to 55 degrees the fan operates at full speed, and with the greater output of air the stable cools down. When the temperature gets below 50 or 55 degrees, the fan takes out only half as much air, which allows the heat of the animals to build up the temperature. At no time are the air movements in the stable interrupted. They simply vary in speed. This is important. This system does away with the need for a damper in the duct, which is always a source of trouble and a brake on the air delivery of the fan.

I am presenting a typical record of performance of the ventilating installation at the R. F. Davis farm near Rutland, taken during the month of February, 1941. Mr. Davis built his own outtake flue in 1939 and I helped install the fan, motor and off-and-on switch at a cost of about $35. That winter, he used a washing machine motor he had on hand and controlled it manually. In this case, we did not use the step pulley, but figured the proper speed for his barn. The results were so good that in 1940 he had me put in the two-speed motor and thermostat control at a cost of about $22. Thus for a cost of $57 plus his own labor and materials on hand, he has a stable ventilating system that has not varied the stable temperature more than 8 to 10 degrees while outside temperatures have varied from 50 to 60 degrees during the season.

About half of the barns that have this system have never had any form of ventilation and about half have had gravity systems that didn't work satisfactorily. One barn 110 feet long had $1600 spent on it a few years ago for insulation and a commercial gravity system which never worked. Last winter I put one unit in one end and this winter will install another in the opposite end. In doing this, we have practically discarded the old flues and depend on natural barn leakage. One hundred and fifty dollars is going to do what $1600 failed to do for this farmer.

It cannot be said that this system and equipment is perfect, but I do know that with a *reasonably well-built stable* and a little judgment, a much better stable condition can be produced at the least cost for equipment and operation yet known.

As for cost of operation, I find that the average is from 75 to 90 kw-hr per month, which in our territory costs less than $2.

EDITOR'S NOTE: At a recent meeting of the American Society of Agricultural Engineers where Mr. Bugbee demonstrated this system, it was brought out that any good ventilating fan could be used in place of the one described. If used in the wall with-

out a duct, it should be placed near the floor; otherwise it should be near the top of the duct. Some engineers prefer to install a fan which will deliver just the right amount of air for the stable where it is installed and run it continuously at constant speed. In this case the cost of installation would be further reduced by using a single speed motor or fan and eliminating the thermostatic two-speed control. Mr. Bugbee favors the two speeds.

**Ventilating Data**

(R. F. Davis Farm, Rutland, Vt., R.F.D.)

| | Outside Temp. | | Stable Temp. | | Stable Humidity | |
|---|---|---|---|---|---|---|
| Date 1941 | A.M. | P.M. | A.M. | P.M. | A.M. | P.M. |
| Feb. 10 | 2 | 24 | 55 | 55 | 69 | 68 |
| 11 | 10 | 24 | 56 | 57 | 70 | 69 |
| 12 | 14 | 28 | 57 | 57 | 70 | 69 |
| 13 | 22 | 31 | 57 | 59 | 68 | 70 |
| 14 | 30 | 38 | 62 | 62 | 74 | 71 |
| 15 | 36 | 28 | 62 | 59 | 71 | 68 |
| 16 | 12 | 14 | 57 | 56 | 67 | 68 |
| 17 | 8 | 20 | 56 | 56 | 69 | 67 |
| 18 | 14 | 20 | 56 | 55 | 66 | 65 |
| 19 | 14 | 24 | 56 | 55 | 68 | 67 |
| 20 | 13 | 30 | 56 | 56 | 69 | 66 |
| 21 | 20 | 30 | 57 | 58 | 67 | 68 |
| 22 | 28 | 25 | 58 | 58 | 68 | 68 |
| 23 | 26 | 23 | 58 | 57 | 68 | 65 |
| 24 | 12 | 30 | 56 | 57 | 66 | 66 |
| 25 | 17 | 14 | 57 | 57 | 66 | 64 |
| 26 | 12 | 16 | 56 | 55 | 65 | 65 |
| 27 | 0 | 16 | 54 | 55 | 66 | 66 |
| 28 | 6 | .. | 55 | 52 | 66 | 67 |
| Mar. 1 | .. | 28 | .. | 55 | .. | 67 |
| 2 | 24 | 30 | 57 | 58 | 66 | 65 |
| 3 | 31 | 38 | 57 | 59 | 66 | 67 |
| 4 | 14 | 12 | 56 | 56 | 65 | 68 |
| 5 | 6 | .. | 56 | 56 | 68 | 66 |
| 6 | 20 | 18 | 57 | 57 | 67 | 64 |
| 7 | 6 | 29 | 56 | 57 | 66 | 66 |
| 8 | 26 | 28 | 57 | 57 | 65 | 66 |
| 9 | 22 | 20 | 58 | 57 | 65 | 66 |
| 10 | 18 | 22 | 57 | 58 | 64 | 66 |
| 11 | 19 | 30 | 56 | 57 | 65 | 67 |
| 12 | 25 | 20 | 59 | 57 | 64 | 64 |

# Calling All Farm Flocks!

**Condensed from The Rural New-Yorker**

*Willard C. Thompson*

THOSE who know what the country will need during the next few months in the line of foods, say that eggs come near the top of the list of indispensable, protective foods. The minerals, proteins, and vitamins in fresh table eggs are qualities which make them so necessary a part of the daily diet of all our people.

Those who know about the way food stuffs are being produced and used insist that the demands for more and more eggs will grow and continue further to grow as the months slip by. Our own civilian population will use increased numbers of eggs. The armed forces of our country are using much vaster quantities of eggs than ever before in history. The countries on the other side of the Atlantic, especially England, are calling upon America for more eggs.

The sum total of laying hens being kept on general farms, as distinguished from those which are being kept on commercial poultry plants, is very great. It is from the great rank and file of general farm flocks that the bulk of this seriously needed increase in table egg production is to come. If every farm flock could be assured of proper feeding, housing, and management during this coming Winter, the resultant increase in numbers of available table eggs would be surprising.

Many of us feel that the required increase need not compel the building up of many new poultry plants, nor the increasing of the poultry house equipment above that already available. It does mean that present available plants and houses, if properly filled with the good laying stock, and if all flocks are managed for a maximum, safe egg yield during the next six months, can be made to meet the emergency.

The farmer who looks at the egg price quotations now being made on the principal egg markets, especially in the northeastern states, sees that prices have steadily increased this Fall and to levels which have not been enjoyed for several years.

If farm egg producers can adopt management practices which will step up the number of eggs gathered and sold from the farms during the next few months, and if anything like pres-

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333 W. 30th Street, New York City, November 1, 1941

ent egg prices prevail over those months, as seems likely, the farmer's income should be materially increased.

In planning for the management of the laying flocks from now on into the Winter, it is possible to lay out a management program which is systematic, labor-saving, economical, and efficient. Such a program needs meticulous following, for best results. Let's line one up, and see what the simple, yet essential, steps in it may be!

1. Look over the farm and see just how many pens there may be which are now ready for poultry laying flocks; and see how many places might be made useful for layers with just a little remodeling and fixing. Few sheds, or pens, or rooms, about the farm buildings should be allowed to run empty through this Winter, if, with a bit of planning, they might serve as homes for poultry laying flocks.

2. Figure on providing four square feet of floor space for every layer housed, and do not tamper with this rule. They need the room and will do better for having it.

3. Keep the layers confined to the poultry houses through the next six months, at least. Efficient layers must be kept close to the feed hoppers, and under comfortable conditions if they are to lay at high levels of production. They gain nothing from being allowed to run out of doors during the Fall and Winter months. They are easier to take care of indoors, and there is better control of health.

4. Arrange the windows and ventilators so that there is a constant flow of fresh air through the poultry houses all the time. Busy layers need a constant supply of oxygen, and should never be forced to breathe in once-used air, for it is laden with moisture and poisonous by-products of their body processes. Good ventilation tends to keep the litter dry, and the poultry house more comfortable.

5. Open the front wall windows daily, whenever outside weather conditions will permit. Closely shut up poultry houses soon become damp and unhealthful. Let the sunshine enter as much of the poultry house as may be possible during Winter weeks. This is why poultry houses preferably should be built to face into the southern exposure.

6. Provide a uniform, 14-hour lighted day for the layers from the middle of October on through till April. This is usually done by means of using electricity, now available in so many farming areas. We recommend the following artificial lighting unit: one 40-watt Mazda globe, or equivalent, provided with a reflector, which is 4 inches deep at center,

and 16 inches in diameter at outer edge, for every 200 square feet of floor area or major fraction thereof. This unit should be located 6 feet from the floor level, and midway between the front wall and the line just in front of the first perch, thus insuring full lighting of the working floor space when the hens are down on it. Put the light midway across the pen, so as to equalize the artificial lighting within the pen.

Turn on the electric lights at four o'clock in the morning, preferably using a time switch or an alarm clock so hitched up to the light system as to turn on the lights automatically. Turn off at daylight; turn on again late in the afternoon when shadows begin to lengthen, and leave them on until 6 P.M. This gives a 14-hour lighted day evenly throughout the Winter season. A proper use of artificial lights should increase the average egg yield from each layer thus lighted by about one dozen eggs during the next six months, and any such increase, at winter egg prices, will pay for the lights many times over. We believe whole-heartedly in the economy and efficiency of artificial lighting for farm laying flocks.

7. Furnish dry mash hoppers at the rate of six linear feet of hopper for every 50 hens, or major fraction thereof. Build the hoppers up off the floor about 18 inches, so as to keep the litter out and maintain the mash surface in sanitary condition. Locate the hoppers in the most convenient, airiest and best lighted section of the room, so that the hens will be continuously tempted to eat from them.

8. Select a well-balanced dry-mash — commercial, or home-mixed, for there are good ones in both categories. Our open-formula, home-mixed, New Jersey laying mash consists of 200 lbs. each of yellow cornmeal, wheat bran, flour middlings, and pulverized heavy oats, 150 lbs. of 55 per cent prot. meat scraps, 50 lbs. dried skimmilk, or dried buttermilk (if this is unavailable now, or too high in price, leave it out and substitute soybean oil meal, about 30 lbs. and high-grade dehydrated alfalfa leaf meal, 20 lbs.), 20 lbs. natural codliver oil, 20 lbs. oystershell meal, or limestone flour, and 10 lbs. salt. Keep some such egg-forcing dry mash before the hens every day and all day. Encourage consumption by putting in a bit of fresh mash every morning, and going through the pens in midday, and stirring up the surface of the mash.

As chill days come along take about 3 lbs. of this mash and mix it up to a crumbly consistency with sour skimmilk, if it is available. Feed this to each 100 hens,

as an appetizer and stimulator. It helps to increase mash consumption, and that must be gained, if high egg yields are to be realized.

9. Supplement this mash with morning, noon, and evening feeding of a mixture of grains, such as wheat, yellow corn, and oats, equal parts, and at about the rate of 10 to 12 pounds of grain per day per hundred layers. Grain and mash consumption should run about equal during the Winter season, although in really cold weather grain consumption will be increased.

10. Keep a constant supply of clean, fresh water where every hen can get at it whenever she is off the perches.

11. Maintain about five inches of good clean straw litter on the poultry house floor throughout the Winter, insulating the hens against the possible coldness, hardness, or dampness of poultry house floors. Do not let the litter become too finely broken, dusty, or wet. Put in new straw every few days, and renew all of it when necessary to keep the hens clean, comfortable, and sanitary.

12. Provide one nest for every five hens. Keep every nest well littered, so that egg breakage is cut to a minimum and all eggs are kept clean. Gather eggs just before noon and again in the afternoon, with clean hands, and using wire baskets.

13. Keep a sharp watch for possible prevention of waste about the poultry house. Put a lip on all hoppers to prevent waste. Patch up cracks and prevent drafts. Look for rats, and if found, eradicate quickly, for a mature rat will eat as much as a hen in a year. We use fresh, sun-dried red squill powder effectively in getting rid of rats.

Well-produced, quality, fresh table eggs from farm flocks must be gotten off to consumers as soon as possible. Held eggs lose that fresh quality which brings better egg prices to eastern farmers.

## Pigs Heaviest at Birth Weigh Most at Weaning

Experience with more than 7,000 spring pigs at the Purdue University Swine Farm have shown that the largest pigs at birth are generally the largest pigs at weaning time. Government experimental data also show that pigs weighing about two pounds at birth weighed about 179 pounds at 190 days old, while three-pound pigs at birth weighed 208 pounds at the same age.

*—Hog Breeder*

# The Alpine Harvest

**Condensed from New England Homestead**

*Marie Widmer*

IN these days of stress when landlocked Switzerland is obliged to attain an always greater degree of self sufficiency, haymaking in all altitudes has gained added importance. Winter tarries long in the Swiss mountains and the carefully housed cattle are to a considerable extent dependent upon the yield of the summer pastures.

Haymaking begins in July and continues without a break, if the weather is favorable, until September. The bountiful meadows in the valleys are cut first. Here the hay is stored either in lofts above the cattle-stables, which on some farms still adjoin the owners' living quarters, or in special barns. In a normally good season a second crop of shorter hay can be harvested in the lower regions during the month of August.

After the first hay harvest in the lesser altitude is well under cover the time has come for the peasants in the mountains to start their work. Hay harvesting in the high alpine districts is attended by countless dangers and the mower knows that he will have to brave death many times a day. His scythe on his shoulder and carrying camp-irons and huge squares of home-spun cloth on nets neatly rolled up in a bundle, he sets out before dawn. During the few harvest weeks a peasant only goes down to the village three or four times to replenish his supplies.

Where the sure-footed goat hardly ventures the alpine haymaker stakes out his field of endeavor. For on the steepest and rockiest slopes he finds the juiciest herbs.

Absolute quiet prevails in these dizzy heights, except for the occasional whistle of a watchful marmot or the call of some wild birds. Bread, cheese and smoked meat are the haymakers' simple fare and when he is thirsty there is always a crystal-clear mountain brook nearby.

The newly mown grass is scattered and dried within a few hours in the broiling sun. As soon as it is perfectly dry it is carefully piled into a cloth or net, then carried down for temporary storage in one of those primitive chalet-type barns which one finds here and there on the steep mountainsides.

In the winter, when a thick

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mantle of snow covers the ground, the peasant climbs up to the place where he has stored his hay, first pulling, later carrying his sturdy wooden sled on his shoulders. Sometimes he is unable to take his sled as far as his barn and is then obliged to carry the heavy bundles of hay on his back until he reaches his vehicle.

In the Samnaun, in the most Eastern part of the Grisons, the hardworking men club together when the time has come for bringing down the hay. Weather conditions are carefully studied and the Council of the valley has to give the necessary permission for this truly dangerous expedition. When everything is in order heavily roped peasant-sleds padded with straws, to prevent any possible loss of hay, are hauled up the mountainside. Since the snow is many feet deep a few young men lead the way by shoveling a path. The difference in altitude between Samnaun, 6,050 feet a/s, and Alp Ceblas, where the hay has been stored, is about 3,280 feet. The ascent consequently is strenuous and the descent also is full of hardships. Often the sleds sink deep into the snow so that the workers have to dig them out again and again.

Bringing in the hay harvest in Switzerland is by no means accomplished after one uniform pattern. Different methods prevail in different parts of the land. Thus the peasants in the Lotschen Valley deposit their bundles of hay through an opening in the roof of their barns. A haymaker in the Emmental mountains loads his bundles on a crate specially fashioned for this purpose in order that he may have an unobstructed view for this going. In the lowlands generally the hay harvest is brought in on wagons drawn by horses or oxen.

In the Great St. Bernard region, in the Valaisan Goms, in the Engadine, as well as in parts of the Bernses Oberland, the peasants use lightly built "ladder-wagons" for taking home their hay. Before loading it they bundle it up in home-spun cloths, about eight bundles making a load. In the Lotschen Valley the price of a pasture is still figured according to the number of bundles of hay which it produces.

A glad event is the Hay-Sunday Festival which is celebrated in the Middle of August and marks the height of summer life on the mountain pastures. First there is an impressive religious service in the nearest church or chapel where praise is fervently offered to God for all His bounties. Afterwards the haymakers, together with their families and friends, enjoy a happy get-together, also their favorite pastimes of singing, yodeling, alphorn and accordion playing, plus dancing and wrestling.

# High Cotton Yields in South Carolina

Condensed from The Acco Press

*D. M. Lipscomb*

Secretary, South Carolina Cottonseed Crushers' Association

ONE of the finest things that could happen in and for South Carolina is happening—our farmers are learning how to farm. That is a queer comment to make about a state that has been predominantly agricultural for more than 200 years, but I offer figures to support it.

Ten crop years ago South Carolina's cotton farmers thought they had done a good job—and they had—when they harvested 245 pounds of lint per acre, the average for the state in 1930. The average per-acre yield for the five-year period ending with 1930 had been only 200 pounds. Two acres and a half only were required in that period to produce a bale of cotton, but that was not then considered bad.

Now come forward 10 years. In the five-year period ending with 1940 the average per-acre yield in South Carolina was 303 pounds of lint, but the truly sensational yields were harvested in 1939 and 1940. In the first of these years the yield was 342 pounds, in the second, 374! No other state in the old Cotton Belt has improved at that rate. Its climate, its soils, its population characteristics do not differ radically from those of contiguous and of nearby states, nor are educational opportunities notably superior.

Then why has South Carolina moved up front, as it has done, in the production of cotton? There have been many contributing factors, such as seed selection, soil selection, wiser choice of fertilizers, cotton-growing contests that have demonstrated many helpful facts, and so on. In addition to these factors, present in cotton production almost everywhere, South Carolina has profited from two special factors. One has been and is the remarkably effective co-operation of many groups directly interested in cotton. The cottonseed oil mills, the ginners, the textile mills, the newspapers and other agencies have worked persistently with and through the Extension Service to improve the status of the cotton farmer in South Carolina.

The other special factor in the story of cotton growing in South Carolina is the method used to fight the boll weevils. We South Carolinians, including our Ex-

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tension Service, think we have something here and we wonder why other states have not learned what we think we know. But that's their business. Meanwhile, we shall continue fighting the boll weevil as we have done for several years, with what we call the 1-1-1 mixture.

This is a simple, inexpensive bait and poison, easily applied to cotton plants. It consists of one pound of calcium arsenate, one gallon of blackstrap molasses, one gallon of water. County agents, cottonseed oil mills, and others make it easy for farmers to get the ingredients. In early summer, just before squares begin to appear, this mixture is applied three times, with five to seven days intervening between applications, and with an application repeated if rain falls within 24 hours after it is put on. The application does not require skilled labor. A worker takes a bucket of the mixture and a small mop, which he may make by wrapping a rag on the end of a stick, and he walks along the cotton rows, dipping and swinging his mop across the tops of cotton plants. It is not necessary to smear the entire plant with this mixture because weevils are attracted to it by the molasses. One drop—but there should be more than one drop—to each plant may attract many weevils, and kill them all.

This early application of the poison kills many or most of the over-winter weevils before they have propagated millions of other weevils. The strategy is as simple as anything: attack the enemy before he becomes numerous, and thus make it impossible for him to become numerous.

The cost of this kind of protection against boll weevil damage may be 50 or 60 cents an acre, labor not counted. For this outlay of 50 or 60 cents, South Carolina's farmers have learned that they receive in return several dollars an acre. It is generally believed that this 1-1-1 boll weevil control plan is a major part of the explanation of South Carolina's sensational drive forward in yield per acre.

In 1939 South Carolina cotton farmers more generally than ever before and much more generally than the farmers of any other state, used the 1-1-1 bait and poison, with remarkable results. Boll weevil damage in South Carolina that year—it was a year favorable to weevil propagation—was only eight per cent, according to official estimates. Every state in the Southeast suffered more weevil damage that year than did South Carolina.

How can that be explained except by our weevil control method? Boll weevils know nothing of State lines, and do not stop at them unless they happen to be broad bodies of water. But there

are no broad bodies of water bordering South Carolina except the Atlantic Ocean on the east.

Some may wonder why South Carolina happened to hit on the 1-1-1 method of control. That is a fine story of fine men working for the state they loved. The late David R. Coker, famous seed breeder and general agriculturist of Hartsville, did more than any other one man to persuade South Carolina farmers to use this method. He did not originate it, but he experimented with it successfully, he announced the results of his experiments, and people listened, as they always listened when he spoke about cotton. J. J. Lawton, a life-long friend and associate of Mr. Coker, was another powerful figure in the rendering of this great service to South Carolina farmers. These men, and others, were pioneers. But the Extension Service workers, of course, put it over. No other agency could have done it. The rest of us have merely done the best we could to help the Extension Service help the farmers.

# Butchering for Home Defense

**Condensed from The Michigan Farmer**

*Leonard Westrate*

IN these days of rising food costs, the position of the farmer who each year butchers enough farm raised meat to provide the family with a well-rounded diet of fresh and preserved meats is an enviable one. Yet there are still many farmers who do not press the advantage to take a healthy cut out of the high cost of living, simply because they think butchering and handling meat is too complicated a process for them. Actually, with careful planning and a little intelligent study, there is nothing very complex about it at all. Here are some of the highlights gleaned from the experiences of farmers and college experiment stations.

Beef and pork are easily preserved for future use by either canning or curing. Mutton or lamb also can be cured, but are better used as fresh meat. The small size of the lamb carcass lends itself easily to preservation in the farm refrigerator and is an asset in the summer months when the meat must be used im-

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mediately. Also with the advent of the community refrigerator locker system, many farmers who have access to such a system now put down several hundred pounds a year and bring home a few pounds each week, assuring a year-round supply of meat at low cost.

Selecting the right kind of animal for slaughter is important. For hogs, one weighing 175 to 200 pounds is best for fresh or cured hams, shoulders, and bacon. Where a year's supply of lard is a consideration, a heavier, lardier hog weighing up to 250 or 300 pounds is more desirable. In hogs there is less variation in the tenderness of the meat between animals of different ages than in any other meat. Even boars are used sometimes by cutting 10 to 12 weeks previous to butchering. Also some farmers report that by not scalding the boar the strong taste is avoided. They merely hang the animal up after sticking and skin as they would a beef or lamb.

In beef cattle, a young one between one and two years old, well fed and healthy, is best, However, there is no reason why an older cow in good condition can not be used, especially when it is to be canned. In some communities "beef rings" are formed in which each farmer provides a beef at a different time, thus averting the need for each family to handle a large carcass alone. Well finished but not too fat lambs are best for meat purposes. And right here is a good place to point out that only healthy animals should be selected for the family larder. While cooking properly renders most meat safe for use, there is some danger from handling meat from a diseased animal. When dressing out a carcass if any abnormal conditions such as pus pockets or diseased gland are found it is advisable to call a veterinarian to inspect it for its fitness for food or the affected parts should be destroyed. Cleanliness is vital to success in keeping meat without spoilage in all operations from butchering down to the final curing process.

Another important item in preventing future trouble is the way the animals are handled before being killed. They should be deprived of all feed for 24 hours before being killed, but should have plenty of fresh water. This will empty the internal organs and also will aid in getting a good bleed, an important factor in getting the meat to cure properly. Also they should not be excited or overheated as this raises the body temperature and causes a feverish condition that has a tendency to sour the meat. And about the worst thing possible is to clout the animal with a club while preparing for the kill. This causes the blood to collect at the

bruised spot and if it happens to be on a ham, or shoulder, or bacon it must be trimmed before going into the cure or it will sour. In the case of hogs and lambs, sticking without stunning is preferable as they bleed much better. Because of the size of beef animals they usually must be stunned first.

After dressing the next step is chilling, as it is impossible to do a neat job of cutting the carcass before it is thoroughly chilled out. Meat never should be allowed to freeze before the body heat has been chilled out of it, as this is often the cause of souring. Butchering in the afternoon when the temperature is just a little above freezing and letting the meat cool out at night is the best procedure. If the weather is not cool enough to chill the meat, hog carcasses can be cut into halves or quarters and chilled in an ice brine made by adding 3 pounds of salt to ⅓ barrel of water and adding chunks of ice.

Meat can be preserved for future use by 2 methods, curing or canning. The basic element of curing is the use of salt to combat bacterial action in the tissues of the meat. The secret of a successful cure is in the use of the right amount of salt and allowing it sufficient time to penetrate. A coarse grade of salt is best to use. Too much salt will impair the flavor of the meat and too little will result in spoilage. Brown or granulated sugar or molasses is sometimes used to counteract the hardening effect of salt, and to improve the flavor. For curing, an earthenware crock or hardwood barrel may be used. One that is cracked or that has ever contained spoiled meat should never be used.

For either of the 2 main methods of curing, dry or brine, the same ingredients are used. The dry cure, in which the salt is applied directly to the meat is quicker, gives a stronger cure, and shrinks or dries the meat out more. With a brine cure, in which the meat is immersed in a solution of water and salt, a more favorable flavor results and there is less shrinkage. In preparing the meat for curing, each piece is rubbed with coarse salt and piled on a table to drain for about 20 hours. It is very important to force as much salt as possible in next to the bone at both ends of hams and shoulders. This is sometimes done by means of a special syringe-like instrument which forces a brine into the interior of the meat. This is called pumping. After salting, the meat is ready for the cure by any one of several good recipes which can be obtained from home extension agents. It is well to remember that the fattest pieces turn yellow and rancid sooner than lean ones and should be used first.

Smoking meat does not preserve it as is commonly supposed. It adds flavor and color to the meat, however, and aids somewhat in preservation by drying it. Hardwood or corncobs are generally used for smoking. A much easier and very satisfactory way to get the smoked flavor in meat is to use a commercial product known as smoke salt. This has the advantage of combining the curing properties of regular salt with a flavoring preparation that imparts a smoke taste to the meat that can't be distinguished from smokehouse flavor. It also has the advantage of curing and smoking at the same operation and is easy to use by following the directions that come with it.

Cured meat can be stored by wrapping each piece first in unbleached muslin or cheesecloth and then in heavy paper, after which it is placed in a bag and hung in a cool, dry, dark, well-ventilated room. Borax dusted over the meat will protect it from skippers, the larvae of the small black fly.

Meat can be canned as soon as the animal heat is out of it, and provides a safe and economical means of preserving it for future use. Good results depend on using a good quality meat, cleanliness, proper preparation, a tight seal, complete destruction of all organisms that might cause spoilage, and correct storage. A pressure cooker should be used if at all possible, but the water bath or oven should not be used for canning meat.

Curing and preserving meat may sound complicated, but with careful study of directions anyone can do a good job of it. All that is necessary is a determination to follow instructions to the letter. County home demonstration agents are willing to help at all times and bulletins on meat handling and butchering are available on request from your county agricultural agent.

# Preventing Cattle and Sheep Bloat

Condensed from Pacific Rural Press

*H. H. Cole*

Division of Animal Husbandry, University of California, Davis

THE commonly accepted theory of bloat is that under certain conditions gas is produced more rapidly than it can be expelled. There is no unanimity of opinion as to what the predisposing conditions are except on the point that bloat most frequently occurs when feeding on young, lush legumes. Some maintain that bloat is frequent when animals are fed frosted legumes. A few years ago we froze some green alfalfa and fed it for some time but we were not successful in producing bloat.

After some preliminary studies on bloat we decided that the first important step was to determine if different feeds did result in variations in the amount of gas produced as is commonly supposed. We found that the simplest procedure was to tap the rumen of the cow by the use of a trocar canula somewhat smaller than those commonly used in sticking bloated cows. Then this canula was connected to an ordinary gas meter and the amounts of gas formed hourly were recorded. The amount of gas formed on alfalfa hay alone, alfalfa hay and grain, and green alfalfa tops were compared. The green alfalfa was cut rather than pastured in order that the amount consumed could be determined. The studies were made on lactating cows in order to obtain maximum feed consumption. The amounts of gas formed on the various rations were very similar, there being slightly more formed where hay and grain were fed than upon the other rations. In all instances there was a rapid increase in rate of gas production when the cow began eating. This explains why bloat may occur so soon after turning onto green legumes.

Some may question whether the green alfalfa fed was the bloat producing type. This can be answered affirmatively for bloat actually occurred during its use.

The results obtained did not, therefore, confirm the commonly accepted view that bloat occurs on green legumes because of an excessive gas formation. In our opinion bloat occurs, not because an overly large amount of gas is formed, but because there is not

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sufficient irritating fibre to induce belching. For the most part, belching is the only means of getting rid of the gas formed in the rumen. The following facts support this view: (1) As stated above, the feeding of green legumes does not result in the formation of an excessive amount of gas. (2) Cattle and sheep are most subject to bloat when fed upon diets such as green legumes or grain alone containing very little irritating fibre. (3) If irritating fibre, in the form of dry hay, is fed with green legumes or grain, the incidence of bloat is reduced.

Here are some suggestions for the prevention of bloat in cattle and sheep:

1. Allow cows to have access to dry palatable hay in the corral before turning onto pasture. If the hay is fed in the pasture the cows may prefer the green feed and refuse the hay.

2. Be cautious in pasturing legumes in the early stages, particularly if the growth is lush, and if it is possible for the animals to consume large amounts in a short time.

3. Observe animals closely when first turned onto pasture.

4. If lambs are fed grain while on legume pasture mix some chopped hay with the grain.

I recognize that none of these suggestions is entirely new. For instance, here at the University Farm they have been feeding hay to lactating cows for years before turning onto legume pastures. The trouble has been that there have been so many suggestions without reliable experimental data to back them up that one has had difficulty in choosing. Incidentally, a more detailed account of the experiments discussed here will be published soon in a University of California Experiment Station bulletin.

## Vegetables

The use of preservative wax emulsions has been speeded up by results obtained in experiments at New York State College of Agriculture. All root crops except parsnips responded favorably. This includes, under commercial conditions: asparagus, immature summer squash, winter squash and pumpkins held in storage, unhusked sweet corn, eggplants, peppers, and tomatoes. The waxing of leafy vegetables or bunched-root crops has always given unfavorable results. Waxing is done by hand or by mechanical equipment. The total cost amounts to between three and four cents a bushel.

—*Successful Farming*

# Driving Chance Off the Range

**Condensed from Kansas Farmer**

*Roy Freeland*

CHANCE is an important word in the life of a range beef calf. This is because commercial cattlemen producing beef stock under range conditions have never paid much attention to the matter of individual matings. Under the general practice of turning several sires into pasture with the cow herd, chance alone determines what bull may sire the calf from any one cow.

In the opinion of Floyd Ramsey, Butler county cattleman, this long-used practice leaves too many important decisions to "old man chance." To prevent it in his own extensive cattle-raising operations, Mr. Ramsey has developed an economical system which eliminates the old element of chance matings in pasture breeding.

The Ramsey commercial cow herd consists of 500 thick-bodied Angus which graze on 10,000 acres of native bluestem grass in the vicinity of DeGraff. During the breeding season, these cows run on pasture, but the bulls do not run with them. Instead, Mr. Ramsey uses the system which he calls hand breeding. It is not to be confused with artificial insemination, and consists merely of having men on hand to turn the proper animals together.

To operate this system, Mr. Ramsey constructed a row of bull pens at a central location in one of the large pastures. With a windmill and tank at this same point, the cows are brought in to spend most of the day at this location, after grazing each night out over the pasture.

The system calls for full-time work of 2 or 3 men throughout the breeding season. Mounted on horses, these men spend the day among the cows, releasing a specially selected bull for each mating. With all cows and herd sires marked with large numbers, the men keep an accurate record of every mating and breeding date.

Altho the new breeding system involves considerable tedious work and labor expense, Mr. Ramsey has found it actually pays big dividends in his practical, commercial beef-raising program. The labor expense, he says, is paid back entirely by the one factor of efficiency in use of bulls. For example, Mr. Ramsey uses only 19 herd sires to service 500

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cows, and he considers that under this system these 19 sires would be enough for at least 600 cows.

In contrast, most range cattlemen use, on the average, 1 bull for each 20 cows in the old system of pasture breeding. This would require 25 bulls for 500 cows, or 30 bulls for 600 cows. So Mr. Ramsey considers the man with 500 to 600 head of cows can manage with 6 to 11 less bulls by hand breeding. At present cattle prices, the saving on this item would hire a vast amount of labor.

However, this saving is only one of many advantages which Mr. Ramsey has found in the hand breeding system. He points out that by selecting the proper sires in each case, the calf crop can be materially improved. For instance, an extremely light-boned cow can be mated to a relatively rugged bull. If the cow has a high tail setting she can be mated to a bull that is especially good in this respect.

Another big advantage is the fact that Mr. Ramsey's system provides for a calf crop of fairly uniform age. This contrasts with the old pasture-breeding system which usually brings considerable variation in age of the calves.

Probably the most important feature of Mr. Ramsey's breeding system is the fact he has an accurate record, showing the production of every cow and herd sire. With this record he can discover poor matings and correct them by using different sires the next year.

When the records show that a cow persistently fails to breed, or produces poor calves, she is culled from the herd. The same is true of herd sires. Mr. Ramsey can discover his poor breeders in one calf crop, while cattlemen operating under the old pasture-breeding system have no way of telling which bulls are siring the good or poor calves in the herd.

This new breeding plan has now been in operation thru two seasons at the Ramsey ranch. Each year, the breeding program was started on May 23, and continued for about 90 days. If any cows remained unbred after that time, bulls were turned out with the herd for an additional 30- or 40-day period.

Records of last year's breeding program show that a high percentage of the cows were settled in the first mating. One bull has a record of 100 per cent in this respect, while the lowest was 61 per cent for one of the other bulls. Heifers in the Ramsey herd are bred at 3 years of age if taken off grass. If the heifers have been grain-fed, they are bred at 2 years of age.

Floyd Ramsey started handling beef steers in 1934. In the fall of 1936, he bought 100 good grade

Angus cows, and the next spring he purchased 75 more. Two years later, he added 390 head from one of the leading commercial herds of Texas, and this rounded out his foundation stock for a good herd of commercial cows.

E. L. Barrier, veteran Angus breeder at Eureka, declares, "The Ramsey breeding program is one of the most outstanding systems I have ever seen for practical production of commercial beef cattle."

Comparing Mr. Ramsey's system with the common practice of pasture breeding, you find five advantages which are important points in the business of any range cattleman: 1. Fewer bulls are needed for a given number of cows. 2. There is opportunity to select desirable matings. 3. Poor matings may be discovered, and avoided the next year. 4. More uniform age of calves is made possible. 5. The owner may have a complete record on prolificacy and ability of each cow and herd sire.

# Vitamins for Beef Cattle

**Condensed from The Shorthorn World**

*James R. Douglas*

ALTHOUGH more than a quarter of a century has passed since the first vitamin was discovered, it is only in recent years that these dietary essentials have come into public prominence.

This particular field of nutrition is only in the stage of mapping, and consequently, our knowledge as to its dimensions and its practical application to the feeding of beef cattle, is quite fragmentary. These vitamins which are known to be essential for specific purposes in beef cattle nutrition include A, the B group, C, D and K.

The animal body has the ability to store excess quantities of vitamins and when this supply in storage is depleted without any vitamin consumption, a deficiency results and complications arise.

Vitamin A is supplied in the form of carotene which is found in greatest quantities in green, leafy roughages and fresh, succulent pasture grasses. Vitamin A deficiency renders cattle susceptible to specific diseases, notably those of the respiratory tract. An

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early symptom of a deficiency of this vitamin, commonly referred to as night blindness, is characterized by an inability to see in a dim light. Lot fattened cattle receiving rations that do not contain green leguminous roughages and stock that are grazed for extended periods on dry, unproductive pastures and ranges which have become devoid of Vitamin A, are likely to exhibit signs of a deficiency unless they are supplied with alfalfa hay or some other green, leafy feed that contains considerable quantities of this vitamin.

Experimental results indicate that as little as one pound of alfalfa hay per steer per day is sufficient to meet the needs. For nursing cows, however, it would seem logical to presume that greater amounts would be necessary. Premature birth is not always traceable to a contagious infection. As a matter of fact, Vitamin A deficiency has resulted in the loss of many calves born prematurely; cows have failed to breed regularly and many of the calves that survive do not make normal progress.

The Vitamin B complex comprises several vitamins. At least five members of this family have been identified chemically and are available in pure form. Recent investigations disclose that ruminants, because of the nature of their digestive systems, possess the ability to manufacture the various members of the B vitamin group.

The rumen, or first stomach, of cattle is quite large and the feed may remain in this compartment for two or three days, thus permitting considerable bacterial action. Bacteria break down the fibrous portions of food and manufacture new compounds including B vitamins. Thus it is clear that while cattle require these nutrients, they produce their own supply and need no supplementation.

Until quite recently, it was presumed that Vitamin C was required only by man, the monkey and the guinea pig. Now it is known that this vitamin is needed by cattle also. Investigation on bovine blood by research workers at the University of Wisconsin indicate that under certain dietary conditions cattle do not change into a useful form all of the Vitamin C, or ascorbic acid, needed for normal functions. A method of treatment has been reported in which a solution of ascorbic acid was injected subcutaneously at three or four day intervals for a period of from five to six weeks. Administration through the feed or stomach proved ineffective due to the unfavorable chemical reaction of the ascorbic acid when contacting the alkaline materials in the digestive tract.

Subcutaneous injection of ascorbic acid as a means of improving the breeding efficiency of impotent bulls has met with quite favorable results. A marked recovery was observed in from sixty-five to seventy-five per cent of the bulls treated. The efficiency of ascorbic acid as a means of improving the impotency of bulls will depend, of course, upon the actual cause of infertility.

This point was emphasized by investigators in New Zealand who have conducted similar tests to those carried on at Wisconsin. They found that bulls of low fertility showed less than two milligrams of ascorbic acid per 100 cc of fresh semen, and bulls of high fertility contained from three to eight milligrams although those in the upper limits were somewhat irregular in their breeding transactions. A figure of slightly over six milligrams appeared to be normal for regular breeding bulls.

The New Zealand research workers found that doses of ascorbic acid supplied at the rate of one to one and one-half grams per one thousand pounds live weight were quite satisfactory when given twice weekly for a period of about five weeks. Larger doses seemed unnecessary. They used twenty-nine bulls in all, and found that about four out of five responded favorably to ascorbic acid injections.

The use of ascorbic acid is not expected to cure all cases of sterility in the bull. These researches do indicate, however, that it is distinctly beneficial when bulls are affected while in the growing and developing stage, or in instances when rather heavily used potent bulls begin to decline in ability to "settle."

Vitamin D is necessary for proper utilization of the calcium and phosphorus in the feeds. In the absence of this vitamin, rickets develop, normal growth is retarded and reproductive disturbances occur. Cod liver oil, good quality, green colored leafy hay and sunlight are sources of supply of Vitamin D. Deficiencies are most prevalent during winter months when cattle are confined to barns and not given advantage of exercise and sunlight on moderate days.

Vitamin E is necessary for reproduction in rodents and poultry and Vitamin K is essential for proper blood clotting, but little is known of the requirements of beef cattle for these two nutrients.

For the most part, these various deficiencies are the result of improper feeding or management or possibly both. They may be avoided by adhering to proper animal husbandry practices.

# Breeding Practices in the Army Remount Service

*Capt. William E. Jennings*

**Front Royal Q.M. Depot (Remount)**

THE importance of well conducted, regular teasing and the keeping of the teasing record cannot be overemphasized. This, I believe, is one of the most important records to maintain if satisfactory or even average results from breeding are to be expected. Four hundred and thirty-two mares (Government and privately-owned) have been regularly teased at this depot during the past six years (1936-1941 incl.). Some very important facts can be learned from a study of these records. It appears that very early (January, February or the first half of March) breeding should not be practiced in this particular section of the country. Most maiden and barren mares show very irregular heat cycles prior to March 15th, with a smaller number, possibly about twenty percent, showing irregularity until April 15th. Climatic conditions varying from year to year have a definite tendency to influence the heat cycle in the prebreeding and early part of the breeding season.

The method of teasing which has been used during the past six or more years has produced very satisfactory results. The teasing record for the past six years (1936-1941 Incl.) has been carefully checked to determine (1) whether or not any change should be made in the method of teasing or the keeping of the teasing record; (2) the rhythm of the heat cycle in maiden, barren and foaling mares; (3) the proper time in the heat cycle to breed. It is of paramount importance that the teasing be done by the same man using the same stallion, year after year. Each maiden and barren mare should be regularly teased each Monday, Wednesday and Friday beginning February 1st and continuing to July 1st. It is all important to establish the heat cycle and note its rhythm in each mare prior to the beginning of the breeding season on March 20th. The degree of heat varies from day to day in the individual mare during each heat period. As each foaling mare foals, she should be added to

the teasing list and teased thrice weekly during the remainder of the breeding season. By using the same man and stallion in the teasing process, the man becomes acquainted with each individual mare, her idiosyncrasies, and the manner in which she manifests heat. Teasing to determine the heat cycle is an individual process which produces individual results often varying from one heat period to the next in the same mare.

Some of the common irregularities manifested in the prebreeding season and first part of the breeding season are as follows: (1) A high percentage of "dry" mares show a very long heat period when they first come in heat in the spring. In some cases this heat period lasts 90 days. In such long heat periods the true heat period can be determined only by vaginal examinations conducted at regular intervals. It is better to wait until the mare goes out of heat and then comes back into a true heat before attempting to breed. No "dry" mare should be bred until the rhythm of the heat cycle has been established regardless of the time in the breeding season. (2) Another common irregularity in the heat cycle which is often seen in the teasing record particularily during the early part of the teasing season is the too frequent manifestation of heat. Many mares will show only a few days out of heat between each heat period. These are not true heat periods and the mare should not be bred in these unless vaginal examination proves the mare to be in heat. The normal heat period varies from two to seven days, the average being about four days. Mares that have a tendency to show consistent heat periods longer than seven days are abnormal. In foaling mares long heat periods (8 to 14 days duration) are not infrequent. In these cases the genital tract has not returned to normal and the mare should not be bred. Treatment or time, in some cases both, are necessary to bring about recovery from the condition. Mares with an infected uterus will often show an irregular heat cycle and long heat periods. (3) There is another common type of irregularity in the heat cycle seen in foaling mares. Many foaling mares will not show heat after being bred. This is particularily true if breeding is accomplished during the ninth day heat period. In 1939 we had four mares that failed to show heat after being bred. These four mares proved not to be in foal when examined per rectum and through the use of the rat test for the diagnosis of pregnancy on the 43rd day. In 1940 there were two and in 1941 there were four which behaved in this

manner. There are some foaling mares which will not show to the teaser in the presence of their foal. It is the practice in these cases to take the mare to the teasing chute, leaving the foal in the stall. Some of these doubtful mares will show then, others will not show to the teaser regardless of the method of teasing employed. We had eight mares this season which behaved in this way. Four of these were foaling mares. These eight mares were examined each Tuesday and Friday with the vaginal speculum. Six of the eight mares were found in heat on vaginal examination, were bred, and conceived to that service. Foaling mares are usually in heat on the 30th day and 50th day after foaling. Any foaling mare which is not showing to the teaser on the 30th day after foaling should be given a vaginal examination to determine whether or not she is in heat.

*When Mares Should Be Bred*

This follows teasing in rank of importance. If first we can determine the regularity of the heat cycle, then we can tell fairly accurately when the mare should be bred. Some equine breeding specialists prefer to breed during the first three days of the heat period, others the middle of the period, and still others prefer to breed as the mare is starting to go out of heat. Each group has its reasons which are well founded by observation and long range experience. It appears, however, from a study of these 432 mares that the best time would be the middle of the heat period. The ideal time is that time closest to ovulation time which some believe can be determined by vaginal examination. This is highly questionable. "Double-covering" is usually reserved until the latter part of the breeding season, one day elapsing between two covers. It is interesting to note that 26 of the 54 depot mares bred in 1941 were covered only once during the entire breeding season. Twenty-five of these twenty-six mares conceived. It is my belief that only in very exceptional cases a mare should be bred more than twice in any one heat. If the covers are properly spaced and the mare is in good genital health, there is usually no reason for breeding a mare more than twice in any one heat.

The breeding of foaling mares presents a unique problem. The proper time to breed these mares will determine the percentage conceiving, aborting, the number of dead, diseased and abnormal foals at birth, the number of heavy afterbirths, the number of retained afterbirths, the number of mares to be cleaned (manual removal of afterbirth), and the breeding record of the band for the following years.

*Breeding on the Ninth Day*
*vs.*
*Breeding after the Ninth Day*

I am particularly anxious to show the adverse effects of promiscuous ninth day breeding (breeding in the foal heat). The records on this brood mare band of fifty-five mares covering the period from 1936 to 1940 inclusive reveal the following:

One hundred ninety-one foaling mares were bred during the five year period. Of these 110 were bred on the ninth day after foaling and subsequently and 81 were not bred on the ninth day.

Of the 110 foaling mares only 48 (43%) conceived to the ninth day breeding.

Fifty-four (67.3%) of foaling mares not bred on the ninth day conceived to one service.

The abortion rate in mares bred on the ninth day and subsequently was 12.8 percent—four times greater than that in foaling mares not bred on the ninth day.

The rate of dead or diseased foals at birth was 7.3 percent in foaling mares bred on the ninth day and subsequently. This is six times greater than that in foaling mares not bred on the ninth day.

The rate of heavy or retained afterbirths was 29.1 percent in foaling mares bred on the ninth day and subsequently and only 21.0 percent in foaling mares not bred on the ninth day.

The rate of mares not conceiving was 14.6 percent in foaling mares bred on the ninth day and but 7.4 percent in foaling mares not bred on the ninth day. One must remember that these 110 foaling mares which were bred on the ninth day, and subsequently, were specially selected as reasonably good breeding risks from the total number of 191 foaling mares bred during this five year period. The 81 foaling mares not bred on the ninth day were passed over on the ninth day breeding because their state of genital health indicated that ninth day breeding would be dangerous. In other words, the group of 110 mares were in comparatively good breeding health whereas the group of 81 were in fair to poor breeding health at the time of the ninth day heat, and it is fairly safe to assume that many were not entirely normal when bred after the ninth day.

During the 1939 breeding season at this depot, 39 foaling mares were bred. Twenty-four (60%) were bred in the ninth day and only seven of the 24 bred conceived to that service, of the seven that conceived to the ninth day service, three aborted prior to the 90th day of pregnancy. In 1940 only two of the 38 foaling mares bred were bred in ninth day heat. During the 1936 breeding season 84.9 percent of all the foaling mares were bred in the

ninth day heat. This is the highest percentage of foaling mares ever to be bred on the ninth day in any one year. Likewise, the highest percentage of abortions (12.8%) and the highest percentage of diseased or dead foals at birth (12.5%) occurred from the 1936 breeding. The only dystocias which have occurred in this brood-mare band during the past five years were observed during the 1937 foaling season.

During the past two breeding seasons (1940-41) breeding on the ninth day has practically been eliminated. No foaling mare was bred on the ninth day in 1941, and only two were bred on the ninth day in 1940. Thirty-eight foaling mares were bred in 1940. Thirty-six (92.1%) of the 38 foaling mares bred conceived and 33 had normal, living foals at birth in 1941. A careful study of the records shows that the ninth day heat is the poorest time in which to breed a foaling mare. Some foaling mares will show heat between the ninth day heat and the 30th day heat. This is abnormal in every respect and should be regarded as such. In my opinion no foaling mare should ever be bred before her 30th day heat and some should be allowed to pass to the fifty day heat or later. Great care should be exercised in the breeding of foaling mares for they are potentially a greater source of trouble than all other classes of mares. Treatment is not necessary in most cases. Rest is indicated in all cases to allow the reproductive organs to return to normal. The length of the period of rest varies with the individual mare. In a small percentage of cases a year's rest is necessary. Two of the foaling mares which were bred in 1940 and aborted late in pregnancy (9½ months and 10¼ months pregnant respectively) had had eleven and eight consecutive pregnancies during the past 11 and 8 years respectively. No definite cause for abortion could be determined on complete bacteriological examination of the aborted foals. The mare that had had the 11 consecutive pregnancies had some little trouble foaling in 1940 and tore rather badly. These two mares were mares that evidently should not have been bred in 1940 but given a year's rest to allow the reproductive organs to return to normal after such a long series of pregnancies. It is believed wise to give each mare a year's rest after having a series of four consecutive pregnancies.

No attempt should be made to breed any mare, maiden, barren or foaling, which is not in excellent physical condition and excellent genital health. The practice of "thinning down" mares to try to increase the rate of conception is to be thoroughly con-

demned. If any mare is to breed year after year, she must be in excellent physical condition to withstand the strain of repeated, consecutive pregancies. Thoroughbred mares and mares carrying much thoroughbred blood often show much relaxation in the perineal region after foaling several times. This relaxation becomes more marked as the mare loses weight and increases in age. Every effort should be made to keep brood mares healthy and in excellent physical condition through judicious feeding, ample and well regulated exercise, clean surroundings, and the best possible care. Many of our best mares particularly thoroughbred mares need every possible attention to keep them fit. This is especially true of the older mares in the band. If care is exercised in the breeding of mares to see that they are healthy and that they are well in heat, the number of services required to bring about conception can be materially reduced. Through the discontinuance of ninth day breeding one can reduce the number of services. The breeding of mares which are not in excellent genital health merely excites inflammation already present. If conception does occur in these cases, the mare usually aborts or has a weak, dead or diseased foal at birth or fails to clean up properly after foaling. In practically every case the end result is very unsatisfactory. Too much emphasis cannot be placed on the importance of breeding only healthy mares to healthy stallions at the proper time in the heat period.

I feel that to maintain high efficiency in breeding i.e., to obtain a high percentage of normal healthy foals, it is not only necessary that the mares be in good physical condition and excellent genital health but also highly important that the stallions be potent and in top physical condition. To illustrate this point, let me cite the records of several stallions used at this depot during the 1940 breeding season.

FLAG POLE, a 12-year-old chestnut horse has been at this depot during the past four years. At the beginning of the 1940 breeding season he was in excellent health and flesh. He was bred to 18 depot mares and 26 outside (privately owned) mares, a total of 44 mares. Everyone of the 18 depot mares bred to him conceived. The number of services per depot mare bred to FLAG POLE and likewise the number of services per conception was 1.84. The number of services per private mare was 1.58. The lower number of services per private mare is best explained by the fact that on depot mares we quite frequently let the horse cover a mare twice in one heat

on alternate days, particularly during the latter part of the breeding season. This stallion was bred on an average of 4.48 times per week during the entire breeding season (March 17 to July 7). Seven services were the greatest number made by this stallion during any one week.

MAJORITY — a 21-year-old stallion, came to this depot from the middle west on January 25, 1940, in very poor condition. He was thin, weak, and heavily infested with internal parasites. By improving his general physical condition, we were able to breed this horse to 23 mares, 19 depot mares and 4 outside (privately owned) mares. This stallion during the first half of the breeding season did not stop his mares. As his condition and health improved, he became more potent and easier to breed. Eighteen of the 19 depot mares bred to MAJORITY and three of the four outside privately owned mares conceived. The number of services per depot mare bred to MAJORITY was 2.32 and the number of services per conception depot mares was 2.17. This illustrates how important it is that the stallion be fit.

*Stallions.* The importance of maintaining stallions in excellent condition has already been discussed. This can be accomplished only through judicious feeding, plenty of exercise, adequate care, and good stable management. During the spring and summer every stallion should be given an opportunity to graze. All feeds should be of excellent quality. A stallion should have all the timothy hay he can eat. The nutritive ratio of the diet should not be too narrow, i.e., there should not be too much protein in the diet. A good grade of leafy alfalfa hay is very desirable particularly in the early spring. Corn, oats and bran should be fed in suitable amounts, the amount of grain depending entirely upon the amount of flesh the stallion is carrying and the amount of exercise he is receiving and able to stand. As the breeding season progresses and warm weather appears oats should be substituted almost entirely for the corn. Exercise is all important. A stallion should receive just as much exercise as his legs and condition will tolerate. Starting about January 1st the amount of exercise should be increased gradually so that the stallion will be in firm flesh and ready to go when the breeding season starts on March 20th. A stallion underfed, undernourished, and in soft flesh is a slow and usually a poor breeder. To regulate the amount of exercise is an all important consideration. Exercise at the walk and trot is best with only very short periods at the gallop.

*Brood Mares*—One should aim to keep brood mares in the "pink of condition" at all times. The practice of cooling out brood mares—letting them rough it—to try and increase the rate of conception in any band is to be severely condemned. It is impracticable and illogical to assume that conception can be favorably influenced by such a procedure. If a healthy mare is bred to a healthy stallion at the proper time in the heat period, conception will occur. If a healthy mare in excellent physical condition bred at the proper time fails to conceive, there is usually some definite reason for this failure. A recheck of the genital health and the condition of the ovaries and uterus will give the answer in most cases. By thinning down such mares little can be accomplished.

The diet should be adequate through the entire year to maintain the mare whether barren or pregnant in top flesh. A variety of good, nutritious feeds is essential to overcome the drain on the tissues of the mare and produce a strong, healthy foal arriving at term. A good grade of alfalfa hay is essential. In feeding mares, as in the feeding of stallions, the diet should not be too high in protein. The nutritive ratio should be calculated as often as the ration is changed. One should try to adhere as closely as possible to a good maintenance ration. As pregnancy advances there is an increasing load placed on the kidneys of the pregnant mare to eliminate the waste products. Practically all the brood mares have reached maturity by the time they are added to the band. With the amount of exercise which a brood mare receives there is a minimum of tissue repair and, therefore, the amount of protein should be kept to a minimum.

*Sucklings*—As soon as sucklings will begin to eat, they should be given every opportunity to feed at first with the mare and later (at three months of age) from a suitable container provided exclusively for the foal. The mare should be tied to allow the foal to eat leisurely from its tub. In other words, as in other types of nursing stock, "creep-feeding" is most desirable. I believe it is impossible to get a suckling too fat. It is imperative that everything possible be done to have the sucklings in the best possible condition prior to weaning. The first winter of a foal's life is the hardest one. There should be plenty of variety in the diet and ample opportunity for each foal to eat at will. There are some mares which are notoriously poor milkers. There are other mares which nurse their foals well with the exception of an occasional foal. In these poor milking mares and other exceptional cases, we

notice that the foal fails to make satisfactory or even average gains between three months and six months of age. In these the use of powdered skim milk daily on the foal's grain has given very satisfactory results. Its use should be continued and careful monthly checks should be calculated of the gains made by the various foals receiving this supplemental feeding. Its use in 1940 on four foals produced very interesting results. Thus far in 1941 there appears to be a repetition of these excellent results.

*Yearlings, Two Year Olds and Three Year Olds*:

Plenty of long forage particularily alfalfa will produce the desired results. Too much grain is not necessary or indicated. These foals are making rapid gains, exercising very heavily (particularly the younger foals) and building up much muscular tissue. Here the amount of protein in the diet can be increased far above that of the brood mare or stallion diet. Hay such as alfalfa which is rich in protein, minerals, and vitamins is an ideal feed. The best grade possible to obtain should be given to these growing foals. While on this high protein feed, no attempt should be made for any reason to restrict the amount of exercise. Plenty of exercise will increase the appetite and make a stronger, more rugged foal.

*Study of Weights and Gains on Halfbred and Thoroughbred Colts and Fillies to be expected:*

For many years all depot raised foals have been weighed and measurements taken of height, bone and girth, at three months, six months and then every six months until the age of four years is reached.

All foals show the greatest gains prior to one and one-half years of age. For this reason it is highly important that everything possible be done to speed up the growth prior to one and one-half years of age through judicious feeding, excellent care, ample, well-regulated exercise, lowering of infestation with the common intestinal parasites through a system of pasture rotation and the proper treatment, when and where indicated, against the common intestinal parasites. Giving any pasture a full year's rest will destroy 85-90 percent of the parasites present. This practice should be instituted at this depot to help lower the degree of infestation with the common intestinal parasites. It has been the experience at this depot that the greatest damage to a foal from these parasites occurs from three months to two years of age. Most damage is done during the first winter of a foal's life. It is further interesting to note that the rate of gain in yearlings and two-year-olds is

greater in the summer months when the animals are on grass. These are the periods between one and one-half years of age and two to two and one-half years of age.

It is the plan at this depot to have all foals delivered between February 15th and May 31st. All foals are weaned in groups of ten between September 10th and October 31st, the oldest being weaned first. It is very important that the foals be in the best possible flesh and health before weaning is attempted.

*Handling Brood Mare Band from the time of Weaning until Foaling*

As soon as possible after weaning has been accomplished, all pregnant mares should be separated from the barren mares. The barren mares should be further classified into two groups: (1) Those needing treatment and (2) those not needing treatment. All barren, maiden, and aborting mares should be carefully checked and rechecked in January—just prior to the beginning of the teasing season to prepare them for the coming breeding season. During the entire fall and winter they should be well fed, well exercised and well cared for. This is important if conception is to occur readily.

The pregnant mares should be placed in winter quarters as soon as possible after November 1st. The mares should be placed in the brood mare stable in the order of their expected foaling. Each stall into which a pregnant mare is placed should be *thoroughly* cleaned and *disinfected* and, if at all possible, painted. There are so many types of virulent infections causing abortions and diseases of the newborn foals that attention should be given to every detail in the thorough cleaning and disinfection of each stall and area in the brood mare stable. I cannot overemphasize the importance of this preparation for the pregnant mare. Should a mare abort after being placed in this clean stable, she should be taken away immediately to a well isolated stable and her stall thoroughly disinfected and all litter burned. The stall should not be used for at least one month. After the pregnant mares have been placed in their clean stalls for the winter, *no new brood mares*—pregnant, barren, or maiden *should be placed in these stalls or pastures for any reason*. Our experience at this depot during the fall and winter (1940-41) emphasizes how important this statement really is. Virus abortion, about which we know so little, constitutes a severe menace. Up to the present there is no satisfactory means of treatment or control. It is from our standpoint the most serious type of abortion. All pregnant mares should be well fed and

cared for and adequately exercised. They and their surroundings must be kept clean and sanitary. The thinner mares should be given extra feed and care to improve their general physical condition as much as possible prior to foaling.

*Handling of Mare at Foaling*

Constant attention is absolutely necessary. The mare about to foal should be well bedded, made comfortable, and left alone. The attendant should be well instructed and well versed in his duties.

*Care of the Foal from Birth to Weaning*

The nostrils of the newborn foal should be cleared as quickly as possible and all vestiges of the fetal membrane removed so that breathing can be accomplished. The umbilical stump should be thoroughly disinfected immediately after birth to prevent the entrance of infection into the blood stream through the recently ruptured open vessels of the umbilical cord. The midwife should see to it that foals slow in rising to their feet stand and start to nurse at least within three hours after birth. As soon as the fetal membranes are passed, they should be placed in a suitable receptable and saved for later examination and weighing. The old practice of manually removing membranes by the attendant is to be severely condemned. No retained membranes, should be removed prior to the 12th hour after foaling and then, only by an experienced operator. The night and day attendant should assist each foal several times to pass the hard fecal pellets. In only a very small percentage of cases is it necessary to use an enema to remove these fecal masses. It was necesary to give an enema to only one of the fifty foals which arrived during the 1941 foaling season. We feel that better results are accomplished through the slower method of "cleaning out" a foal.

# Feeding and Management for High Egg Production

Condensed from Everybodys Poultry Magazine

*C. E. Lee*

SOME of the finest flock records in the eastern United States are being made by caged layers at Jackson Townsend's Bunker Hill Farm, Hoosick Falls, New York, under the management of Farm Superintendent Stuart Brownell.

Mr. Townsend has been operating a poultry plant at Bunker Hill Farm for a number of years, but it is only during the past few years that he has tried cages for some of his layers.

At first, only the lower floor of one building was used for laying cages. Results were so outstanding that the number of cages has been increased, and it seems likely the whole plant will be changed over to cages in the near future, unless the present emergency makes it impossible to get the necessary equipment until after the war.

The breeding program followed on this farm is very interesting. The best cage layers are taken out of the batteries at the end of their laying year and put out on range. After their rest period and molt, they are mated up with pedigreed cockerels purchased from a well-known breeding farm.

The chicks hatched from the mating of these selected battery layers and pedigreed cockerels are sold as day-old chicks, particularly to operators of cage plants. Only the best of the cage layers are used as breeders, and these are selected not only on the basis of egg production, but also from the standpoint of body size, freedom from standard defects, and uniformity of type. Appraisal of egg records, of course, also includes size of eggs, shell texture, and chalk-white color.

Mr. Townsend laid out this program on the basis of certain assumptions which we believe to be facts. He assumed that we already have enough able and talented breeders in this country, but that we have too many other breeders and not enough "reproducers." He felt that the soundest procedure for anyone desiring to produce quality chicks would be to get his own foundation stock

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directly from one of the leading breeders, using a program demonstrated to be scientifically sound, to reproduce the stock, and to go back to the primary breeder from time to time to replenish the foundation.

Moreover, since Mr. Townsend is particularly interested in producing stock that will do well in cages, he felt that it would be advisable to select his breeding hens from those that had given superior performance in laying cages, then give these birds a good vacation on the range, bring them into a regular laying house, and mate them up. It seems to us that this procedure is basically sound.

The most recent group of battery layers to finish a 12-month period at Bunker Hill Farm included 216 birds at the start. Out of this group, there has been a mortality during the year of six birds. Thirty-three other birds were culled out during the first three months for failing to reach an average of 50 per cent production or better for those months.

The 177 birds which finished the year made an average of practically 260 eggs per bird. In other words, 82 per cent of these pullets laid more than 200 eggs, and the average for the 82 per cent was 259.966 eggs per bird.

The highest record in this group was 322 eggs, and eight out of the 177 birds which finished the year made an average of 300 eggs or better. Higher individual records are not by any means unknown, but for consistently high performance, the records made by these birds are hard to beat.

Stuart Brownell, farm superintendent, has given us the following data on the 177 birds which finished the year. No scratch grain was fed, the feed consisting of a commercial battery laying mash and supplementary fleshing pellets.

**TABLE I**

| | | |
|---|---|---|
| Number of hens | | 177 |
| Total number of eggs | | 46,014 |
| Average number of eggs per hen | | 259.966 |
| Value of eggs @ 30c per dozen | | $1,150.35 |
| Feed cost: | | |
| 15,440 lbs. mash | $386.00 | |
| 1,715 lbs. fleshing pellets | 51.45 | |
| Total feed cost | | 437.45 |
| Profit over feed cost | | $ 712.90 |

While not all groups have done as well as this one, the records thus far have run between 237 eggs per bird and 260 per bird on the various lots, and some of these groups made around 240 eggs per bird with no culling and with less than 5 per cent mortality, the birds that died being the only ones not included in the final records.

Poultrymen who are interested in improving their production records, particularly those who are

operating cage plants, will find Bunker Hill Farm a very interesting place to visit.

Edward Strobeck would feel that this flock had gone all to pieces if they didn't average well over 225 eggs per bird per year. Strobeck is a very careful and conscientious poultryman with very evident skill in handling his birds.

The Edward Strobeck farm is near Unadilla, New York, in the Susquehanna Valley, in south central New York, about 35 miles north west of Binghamton. This is hilly country and a good deal of the Strobeck Farm is on a hillside, giving good drainage of both air and water.

The stock is purchased, as baby chicks, from a nearby breeder, and consists entirely of Leghorns. These chicks are brooded in 12 by 12 colony houses. Gas brooding has been tried this year with great success. The colony houses are scattered over the hillside on land which is partly clear and partly wooded, so that the birds have plenty of shade and at the same time have a certain amount of grass available.

In the laying house the box-type nests open at the front for egg collection, but the birds enter from the rear, so the nests are kept dark, these nests are of a modified New Hampshire box-type, having only one partition in 5 feet of nests, and this is mainly for structural strength. They are easy to clean, as the whole section pulls out and can be emptied almost instantly. Fewer broken eggs and fewer dirty eggs are experienced with this type of nest.

It is the custom on the Strobeck Farm, as with many others in this area, to keep a small pen of pullets separate and to refill the larger pens with birds from this spare pen as mortality and culling make it necessary.

Poultrymen who follow this practice feel that it is very much easier to feed and otherwise handle their pens of birds if they keep the pens up to full strength or nearly so throughout the year. If they let them get down, perhaps they may not be entirely sure just how many birds there are in the pen, and, therefore, are not certain just how they should be fed. These poultrymen follow a definite feeding schedule varying the scratch grains according to the breed and the season of the year and the noon feeding of fleshing pellets being varied according to the level of egg production. It is essential to know the correct number of birds in each pen. When this program is followed carefully and in detail, the results speak for themselves.

# Packers Want Top Veals

Condensed from Missouri Ruralist

ARE dairymen overlooking a good bet in not producing more top veal calves? Or can they afford to put much milk into a calf to make him a top veal, considering the present good market for milk?

These pertinent questions held the limelight at a meeting of Missouri and Kansas county agents and other agricultural leaders at Kansas City recently.

The packers say that the Kansas City market could easily absorb about 500 to 1,000 per cent more good veals, without depressing prices, if the increase would come gradually.

Representatives of the packing companies and stockyards told the county agents, "We want more top veals." County agents countered with, "Can you pay enough to make it profitable to turn out a top veal?"

Just what is a good veal? Here is a good description that pretty well covers the subject:

"Choice veal comes from calves of the proper condition and texture of flesh, weighing 160 to 220 pounds alive, between the ages of 5 and 8 weeks. A choice veal is characterized by the pinkish color of the skin inside the ears, around the eyes and around the tail head, and by the thick, soft coat of silky hair and bushy tail. Fatness of calves can be determined by the amount of fat in the crotch, flank and breast.

"The most desirable veal calves received on the market are produced from dairy cows as a rule. Processors believe that calves to yield choice veal must have plenty of milk to produce the desired light-pink carcass, as nearly white as possible, containing an abundance of 'baby fat' and free from spots. It should be firm, rather than soft and flabby, and should be smooth and velvety in appearance. Dark-colored or coarse-grained carcass is an indication of too much age, insufficient nourishment, or too much coarse feed.

"The conformation or shape of calf required is a broad, compact body with full, thick development throughout and especially in the rib, loin and legs, since those are the most valuable parts of the veal carcass. Long shanks, long necks, and sharp backs are the most common faults of form. Therefore, it is recommended that calves of more angular conformation be marketed at a live

Reprinted by permission from the Missouri Ruralist, November 8, 1941

weight of around 160 pounds before they grow enough to further develop their undesirable conformation."

Kansas City packers say that: Of the veals slaughtered in the last three years only 20 per cent were top vealers, weighing 180 to 220 pounds, and 6 to 8 weeks old. About 20 per cent of the veals were too light, another 10 per cent were too heavy.

Other criticisms were that they are too dark in color, are bruised from rough handling, and are too thin in condition.

Biggest factor in producing top veals would seem to be milk. Where milk is available for the calves, it would appear to be profitable to veal out calves not wanted for breeding.

Whole milk feeding produces the best grade of veal. Where the calf receives grain and hay in addition, these should be fed in limited amounts. Calves fed three times a day and confined so that they get little exercise will fatten most rapidly.

During the first week, give about 7 pounds of whole milk a day to the 60-70-pound calf, 8 pounds to the 70-80-pound calf, 9 to the 80-90-pounder, and 10 to the 90-100 pound animal. After the first week increase the milk until at time of marketing the calf is receiving 16 to 20 pounds a day. This is according to Joseph B. Shepherd and Fred W. Miller, of the U. S. Department of Agriculture.

Packers point out that the country's choice veals come from the dairylands of Wisconsin and Minnesota—where there is a good market for milk. If these thrifty dairymen consider it profitable to feed milk to veals—why won't it pay elsewhere?

They point out another reason for better veals from those sections—housing. The choice veal is light in color, you will remember, and it won't be this color, if allowed to stay out in the sun and weather. Choice veals are confined to sheds or barns, at least most of the time.

Most of the veal carcasses are sold in the East and the market is a critical one. Kansas City is getting too many plain and common calves to satisfy this Eastern market.

The problem is up to the dairymen. With a little further research as to how much milk is required to produce a veal calf, he will be in a better condition to decide whether he wants to try to top the veal market.

# Speed in Farming

**Condensed from Successful Farming**

***Fred Hawthorn***

STATED briefly, getting "speed" from tractors involves doing the most work of high-quality per day with the least amount of fuel, oil, and repairs under conditions favorable to long tractor life. Two things are necessary to get these results: (1) Proper adjustment and mechanical condition of tractor and machinery; (2) the right speed for the load. In the light of 25 years' experience operating 400 Iowa acres and testing experimental model tractors in co-operation with a large machinery company, I shall offer my conclusions relative to efficient speeds and loads.

As illustrations of the main point, let us take two extreme examples of how *not* to operate a tractor. The first is a fellow driving his tractor-cultivator lickety-split down a corn row with his shovels up. He covers a lot of ground, but gets nothing done. Equally foolish is another farmer who hooks to a bigger load than the tractor can pull and just sits spinning his wheels. He expends a tremendous energy, but like the first fellow, gets nothing done. Somewhere between the two extremes there is a happy medium of speed and load which I hope my experience will help you find on your own farm.

On many jobs the nature of the work indicates the field speed rather than questions of tractor efficiency. Where higher speeds are out of the question I have sought greater loads in order to give my tractor opportunity for full power use. A corn planter is much too light a load for a tractor, yet the ordinary planter will not properly check corn at speeds above three and a half miles an hour. For many years I have hitched a corn planter with a stub tongue behind a two-row lister. A perfect job of checking corn is done in the lister ditches, and the tractor has plenty of work to do all the time.

Last year my plowed ground was let lie until planting time. Then, instead of the customary disking and harrowing, I put on the two-row tractor-cultivator equipped with 10-inch sweep shovels, hooked the planter tongue to the rear tool bar of the cultivator, and proceeded to cultivate the corn before it was planted. I have never yet stumbled onto a hookup that worked better.

**Reprinted by permission from Successful Farming, Des Moines, Iowa, November, 1941**

The Illinois Experiment Station suggests that farmers exchange the use of machinery on some jobs in order to provide more efficient tractor loads. For instance, if you borrow your neighbor's grain drill to hook up with your own and in turn loan him yours, both of you will have two drills which will give your tractors sufficient load.

A tractor will easily handle the combined load of a roller hooked behind the drill, with material saving of both fuel and man-hours over separate operations.

Where it is impractical to increase the load and the only answer seems increased speeds, it is well to bear in mind that shock loads on the machinery are nine times as great at six miles per hour as at two, which suggests the desirability of mounting machinery on rubber tires for high-speed operation. It is also well to keep in mind that a rubber-tired tractor having no springs will start to bounce on rough ground and get out of control at speeds which are perfectly safe for a car. According to the chief engineer of one large implement company, a tricycle-type tractor with 56-inch rear wheel tread turning on a 30-foot diameter circle will upset on level ground if driven faster than 10 miles an hour. He warns that when turning corners, five miles per hour is plenty fast enough for any driver.

When it comes to plowing, there is ample opportunity to load the tractor to the limit, but a question of efficiency of operation arises again between extremes of load and speed. In plowing tests I have made on a 4,500-pound, steel-wheeled tractor, a 14-inch, three-bottom plow pulled three and six-tenths miles per hour gave the best economy. Plowing costs were practically doubled when shifting to two and five-tenths miles-per-hour-gear with two bottoms. With both two- and three-plow loads, the use of higher gears resulted in lower fuel used per acre and less overhead charges. The two-bottom plow at four and eight-tenths miles per hour made second-best showing, although quality of job was not as good and control of outfit at the corners was more difficult.

More recent tests made on a 3,850-pound, rubber-tired, row-crop tractor showed an average of 20 percent less fuel used per acre than with the heavier tractor on steel wheels. However, the same general trends were noted. The use of higher gears always resulted in less fuel used per acre. In all of the four field speeds, the three-bottom plow showed the best economy, although there was practically no difference in third and fourth gears. Best work was done in third at three and nine-

tenths miles per hour, so I consider this the most practical gear for this load.

When pulling a load, there is always some wheel slippage. But it may surprise many to learn that a tractor is not working at best efficiency unless loaded so that slippage is around 10 percent, even as high as 15 percent in plowed ground. Recent experiment-station tests have shown this to be a fact.

Excessive slippage results in a loss of power and rapid tread wear on rubber tires. It may be reduced by lightening load or adding rear-wheel weight. We find that tire chains greatly reduce slippage on wet surfaces. A higher hitch point adds weight to drive wheels and this reduces slippage, but going to the extreme on this will not leave enough weight on front wheels for proper steerage. On hard pulls, it may even cause the tractor to rear over backwards, with disastrous results for the operator.

Up to this point I have considered only tractive efficiency: choosing the load at which the greatest percent of the engine's power will be converted into useful work at the drawbar. From the standpoint of motor efficiency, Nebraska tests show that any engine will deliver the greatest

For most economical operation, whenever the job will permit, load the tractor to the point of best tractive efficiency and then choose a gear that will give your motor practically full load. For light field loads it makes for economy in fuel consumption to use a high gear and run the motor slower if equipped with variable speed governor for better control.

amount of power per gallon of fuel when operated under a wide-open throttle and full compression. Thanks to the new variable-speed governor which has now replaced the old hand throttle on all modern tractors, we can often save several gallons of gasoline in a day's run by taking advantage of this fact. Instead of letting the engine run at full speed under light loads, it is possible to cut motor speed and shift to higher gears to maintain the desired travel speed. The result is a more nearly open throttle, higher compression, and much improved motor efficiency.

Overloading the transmission of a properly designed tractor operating on rubber is a hard thing to do because the tires act as a very effective slip clutch when too much power is applied. A motor can be overloaded, however, in the higher gears. The symptoms are black smoke from the exhaust, with the engine slowing down and laboring below governed speed. Then it is time either to shift to a lower gear or lighten the load.

# Tooling Up for Soil Conservation

Condensed from Soil Conservation

*Harry L. Carr and G. E. Ryerson*

WITH little fanfare and publicity, but with speed and thoroughness, the American farm plant is being tooled up for soil and water conservation. The process has been going on for several years; lately it has speeded up paralleling in intensity the mounting enthusiasm among farmers for farmland improvement.

New methods in agriculture require new tools, because the farmer depends upon his implements and machinery no less than does the factory. As progress in soil conservation techniques has brought changes in agricultural practices, farm equipment men have developed new machines and altered old ones to meet the new demands. Experiment station experts and soil conservation technicians helped with ideas and inventions. And, as always, the American farmer made his own contributions to farm technology.

Most interesting, perhaps, of all the machinery and equipment recently developed in response to the demands of conservation farming are those for new methods of tillage, particularly for stubble mulch.

The stubble mulch system of cultivation has been called "the most promising conservation development in recent years." The term is applied to any process of protecting cultivated or bare land by the use of a complete or partial surface covering of crop residue or stubble. Most of the implements for this purpose provide for subsurface tillage without disturbing the surface litter. They range from a straight blade, drawn through the ground a few inches under the surface, to modifications of the duck-foot shovel, with the wings lengthened and mounted so that the cuts overlap.

The old rod weeder has come out in a new guise, with a modified duckfoot shovel that rides in front of the rod, permitting use of the machine in hard ground. Another machine, a sort of hybrid of the field cultivator and chisel equipped with bull-tongue shovels, loosens the soil without covering the surface litter.

All these implements are being built strong enough and with suf-

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ficient clearance to work in unplowed ground without clogging.

Other subsurface tillage machines of the shovel type are being built for row crop cultivation. Disks are being used to prevent covering of the crop. The conventional moldboard plow has undergone major operations to enable it to perform its usual operations without unduly covering the surface litter. The disk harrow has also been revamped—the curvature of the disks is made shallower so that it does not throw soil over the surface residue.

Another machine has been developed that gathers up trash in front of the tractor and blows it over the ground after the plow has passed, thus permitting a conventional plowing job while maintaining the cover of plant litter. A new mulcher, fed through a hopper, distributes any type of mulch in uniform layers over crop rows. In a few areas a rotary subsoiler is being used, which breaks up the soil without materially altering the surface layer.

Other tillage implements designed for conservation of soil and water are the various damming and basin-forming machines. Damming attachments are being manufactured by most of the implement companies for use with their conventional listers, and basin-forming attachments are sold for use with practically all types of farm tillage machinery. There is even a basin-forming chisel. Soil conservation men have also developed a machine to form dams in furrows left by corn cultivators.

Implements for surface tillage have not escaped the attention of conservation-minded inventors. Subsoiling attachments for conventional plows are gaining in popularity. A rotary hoe attachment on a row crop cultivator has proved helpful, not only for weed control, but in eliminating the furrows left by the cultivator. Operated backwards, it will work in trashy cover without picking up litter and clogging. A special machine has been developed for cultivating kudzu.

Use of the two-way plow is spreading rapidly. Several manufacturers are making mounted types, while nearly all make the trail type.

To meet the increasing needs for machinery for planting and seeding, especially in the field of cover crops, American inventiveness has furnished a number of new devices. There are cyclone seeders for attaching to corn cultivators, to permit the seeding of cover crops at the time of the last cultivation. Similiar attachments for cultipackers aid in the establishment of crimson clover. Other machines simplify and speed up the establishment of

sod. Various stationary shakers and attachments for moldboard plows reduce the cost of harvesting Bermuda sod for transplanting. Complementing these machines are devices consisting of furrow openers, hoppers for the Bermuda roots, and chutes for dropping the sprigs in the furrow. Covering devices follow, sometimes with press wheels.

The opener type double disk coulter, further improved, has come into wider use for native and tame grasses as well as small grains and in all types of mulch. Modifications in grain drills have improved their covering ability and minimized clogging troubles while operating in trashy cover. A grass seeder has been adapted for use in conjunction with the blocking lister. The field scale planting of kudzu has been greatly facilitated by the development of a special kudzu planter, and large-scale tree planting is made easier and cheaper by a newly perfected machine.

Among farmers who object to drilled corn in contour operations, hill-dropping attachments are increasing in general use. Potato planters have been modified to permit effective operation on the contour. This modification permits more accurate control of depth and the relationship between seed and fertilizer placements.

The spread of conservation farming has also had its effect on harvesting equipment. The development of small combines has removed much of the difficulty of harvesting small, irregularly shaped fields. A pusher-type mower has been developed that will work in narrow spaces in orchards inaccessible with conventional offset mowers. Potato diggers have been altered so that the bed can be kept level while the machine is traveling on the contour, thus preventing crowding and bruising of the potatoes.

Combines have been equipped with straw spreaders to protect the soil and add organic matter.

For harvesting soil-building and soil-conserving crops there are devices for lifting kudzu crowns, cutter bar attachments to permit the mowing of kudzu, mower and combine attachments for collecting lespedeza seed, and other equipment for harvesting the seeds of native grasses—formerly very expensive and difficult to collect.

The gradual advance of terracing from the South to all other sections of the country has brought with it new, simpler, and better terracing machines. Some are heavy and large, for the professional terracer; others are designed for use by farmers. Among contractors and co-operatives, the road maintainer or auto patrol has become popular for terrace building because of its one-man

power-operated controls and self-propulsion on the highway.

For farmer use there is a combination plow-terracer consisting of a conventional plow bottom delivering its furrow slice to a standard terracer moldboard. Small farm tractors have been equipped with power-controlled disks which show great promise in terrace construction. The "whirlwind" terracer is now available in a reversible model. The small elevating grader type terracer has been made better and cheaper.

Significant advances have been made in adapting ordinary equipment to terrace building. Good terraces are being constructed with slip scrapers, rotary scrapers and fresnos at very slight cost. The standard orchard disk harrow has been used successfully to build up terraces in orchards by repeated disking. Other commercially manufactured terracers have been modified and improved to keep pace with rapidly increasing knowledge of this important soil-conserving measure.

Earth-moving equipment has been made available to farmers by means of small wheel-type scrapers for use with the ordinary farm tractor. Such machines enable farmers and ranchers to construct ponds, water storage dugouts, diversion ditches, and other earthworks. Crescent scoops used with double-drum tractor-mounted winches are also employed in farm pond building and similar work. Truck excavators have proved valuable in cleaning, deepening, and widening drainage ditches too small for dragline operation.

Contour furrowing machines of many types have been developed, most of them modifications of conventional equipment. Some are shovels attached to standard terracer blades that cut a furrow and spread the soil bank in one operation. Others are modifications of standard listers with the moldboard or the wings of the share removed or cut. Sometimes damming devices are attached to these same furrowers. For use in heavy sod, a contour furrower has been developed that cuts the furrow without disturbing the sod. This implement is made in a reversible model.

In the field of irrigation agriculture, new machines save soil and water. For orchard use, among the most promising are those for constructing broad, shallow irrigation furrows. These furrows have numerous advantages over the old narrow V-type in that fewer roots are severed, a better distribution of water is obtained, and erosion damage in the furrows is greatly reduced. Other devices such as disk ridgers are also finding wider application in this work.

Improved nozzles and land

leveling devices have helped conserve water and minimize erosion in sprinkler-irrigated areas.

Other new developments and improvements in agricultural equipment have helped make soil conservation farming easier, cheaper, and more practical. The increasing use of pneumatic tires and power-controlled implements has simplified the maintenance of permanent grass in waterways and other vital areas. Improvements in electric fencing have made it easier to control and defer grazing. Light, maneuverable tractors with adjustable hitches have facilitated farming on the contour and on small, odd-shaped fields. Stronger spreaders have advanced the use of marl; and other machines, such as the V-bottom trucks equipped with spreaders, have made liming easier and cheaper.

The list could be extended indefinitely. Progress is so rapid that it is difficult to keep abreast of the products of the American genius for invention and gadget-making that have an application in conservation farming. The development of farm equipment is following close on the heels of the conservationists. Whenever there is a new need or a new practice that will help in the husbanding of farm resources, American craftsmen will, as they have in the past, make a machine that will do the job. With the help of equipment manufacturers and agricultural technicians, the American farm plant is tooling up for whatever demands the future may thrust upon it.

## Potatoes Grown Under Straw

For two years, Charles Wolfe, of Youngstown, N. Y., has planted his potatoes by dropping the seed potatoes on the soil and covering them with straw. His experience has been that the potatoes grow to a good size and require no spraying nor cultivating. At harvest time the straw and potato vines are pitched aside with a fork to uncover the potatoes for picking.

This year Mr. Wolfe carried out an experiment to determine how much straw is required for best results. At planting time, he covered one-half of a test plot with 10 inches of wheat straw and the other half with 18 inches. In the middle of August there was heavy growth where the 18 inches of straw was used, while only sparse foliage where the 10 inches of straw was used. No potato bugs could be found in the entire plot and only a few thistles appeared in the portion where the 10-inch covering of straw had been applied.—*S.O.P., New York*

*—Rural New-Yorker*

# How Much Dairy Grain?

**Condensed from Capper's Farmer**

*Glen A. Myrick*

PORING over one of the cow test association's annual summaries, a visitor at the extension agent's office in Medina county, Ohio, came upon a striking fact: The dairy herd that ate most grain during the testing year ranked tenth among the 38 herds with 392.6 pounds of fat a cow. In eleventh place, with 391.3 pounds, was the one that consumed the least. Grain costs a cow were $79.35 and $14.78, respectively. The former had been grained 5½ times as heavily as the latter! What had that done to profits? Returns above feed cost were $53.82 a cow in the first herd; $113.93 in the one fed sparingly. Each animal in the latter group cleared $60.11 more than the average of those heavily grained, and lacked but $1.10 a cow of equaling the average cleared by the top herd, which produced 124.8 pounds more fat a cow.

The dairyman with low concentrate costs was Walter F. Hach. Inquiry revealed he once had been a heavy feeder of grain, too. A little more than 10 years ago, his ration contained 24 per cent protein and each cow got a pound of grain for each 3 pounds of milk she gave. On it, cows made him a lot of milk but little money. Breeding troubles finally forced the conclusion rich feed was burning out the cows and eating up profits.

But correcting breeding difficulties, cutting costs and shifting the dairy project over to the profit column was nothing so simple as reducing protein and giving each cow a smaller feed of the diluted mixture. That is because an adequate dairy ration consists of more than the protein, fat, carbohydrates, and crude fiber it contains. A cow may get all of these she needs and still be starved to marginal production if the feed is lacking in lime and phosphorus, as were crops Hach was then producing. These elements, essential for animal growth, body maintenance and production, had been removed from the soil through long years of cultivation.

Hach, alert for information that would help solve his production problem, made a tour of Ohio Experiment Station plots,

Reprinted by permission from Capper's Farmer, Topeka, Kansas, November, 1941

and went home convinced that lime must be the base on which to build a fertility program that would feed his herd adequately. About this time he read two farm paper articles that had a big influence in directing him wisely. One related that when Shorthorn cattle were taken to a certain island in the Pacific where grass grew luxuriantly, the second generation seldom attained a weight in excess of 600 pounds, but that after the soil was limed and phosphated progeny of both first and second generations grew to the stature their inheritance justified. The second reviewed experiments in southern Ohio pastures so long grazed that most of the calcium and phosphorus had been hauled away in the milk and meat they had produced. When lime and superphosphate were applied, bluegrass and white clover, with no reseeding, came in again to crowd out poverty grass and weeds.

The program of soil regeneration was begun by spreading a carload of ground limestone on rotated fields and another on the pasture. The latter got an application of 400 pounds an acre of 20 per cent superphosphate, and the steeper slopes were covered lightly with manure. Blackberry vines and thornapple trees were removed so the pasture could be mowed. The next spring, Hach put 150 pounds an acre of a grandular, lime-base nitrogen on the pasture.

This improvement was started in a series of dry years, and the 30 acres that got the nitrogen were grazed but 6 weeks when the 20 cows had to be put up for barn feeding. The next spring a state pasture specialist wrote Hach to request that he keep data on returns from his treated pasture. He wrote back that he was about ready to plow up all pasture because he felt he could keep more cows by farming the ground.

Early in 1936, the worst drouth of all started, but Hach had his silo filled with well-matured corn. Let drouth come; he felt he was ready for it. Despite heavy feeds of silage and grain, however, cows dropped steadily as the weather warmed. Drouth checked growth, so alfalfa hay was cut early. A start was made at breaking up the pasture, but on the second round the plow was broken, and before it could be repaired Hach had a demonstration that was to renew his faith in pasture. By July 20, he could see there would be no second cutting of alfalfa, so he opened the gate and turned in the cows. They refused silage, went up in milk and stayed up. Later they went to Sudan, and barn feeding was not required until the end of the growing season. That summer the production manager of the

creamery to which he shipped milk showed him a chart that indicated a dairyman netted nothing except in months when cows were on grass.

"I decided then," Hach said, "to try to make something six months of the year and break even if I could during the other half. That fall I seeded 17 acres to rye, and planned to put 12 acres to oats and peas and shift the 17 acres to Sudan when rye was grazed down. The next spring was wet, and cows didn't get on the rye until May 6. Grass came early, so I turned on permanent pasture May 28. I had the Sudan ready by the time bluegrass ordinarily needed rest, but the lime and phosphate had begun to work with wet weather and permanent pasture still was good. So was Sudan, and second-growth alfalfa was bounding ahead. Cows turned down grain, which by then had been reduced to 12 per cent protein, and how they were rolling out the milk!"

The summer silo wasn't opened that year, and it never has been needed since. Thru the four flush pasture months the herd gets no grain, not because Hach arbitrarily has cut them off but because they refuse it. Pasture has all the feed elements they need for body maintenance and heavy production. Grain normally is richer in phosphorus than grasses. When the latter does not contain plenty, cows are likely to crave concentrates, even tho pasture is palatable and supplies more bulk than they can consume. Dairy animals that take grain on lush grass probably are telling the owner he might profitably lime and phosphate the pasture. Hach finds it cheaper to feed such mineral elements thru forage. Grasses supply them more economically, and cows do the harvesting in grazing months. The turned pasture furrows have grassed over, and there is no thought now of plowing up the sod.

The lime-phosphate program has worked out much as it did with Shorthorns on the Pacific island. Hach started with average-size Guernseys, has introduced no new blood into the herd either through the male or female line in 15 years, and it is not unusual now for mature cows to weigh 1,400 to 1,450 pounds.

"I believe with plenty of minerals in the soil, cows can reach their inherited limit," Hach said. "I prefer big individuals with plenty of capacity, and I like to employ that capacity in utilization of high-quality roughage. I don't believe grain is a natural feed for cows, and no animal in my herd ever gets more than 10 pounds of it a day. They stay healthy, breed regularly, and have returned as high as $3.18 for each dollar's worth of feed consumed in a year."

# Some Work of Agricultural Chemists and Engineers

*Dr. W. W. Skinner*

Associate Chief, Bureau of Agricultural Chemistry and Engineering
United States Department of Agriculture

THE Bureau of Agricultural Chemistry and Engineering was created in 1938 from the Bureau of Chemistry and Soils and the Bureau of Agricultural Engineering. On both the chemical and engineering sides it stems from some of the very earliest work in the Department. The first scientist employed in the Department of Agriculture was a chemist and the first report of research work in the Department was on the chemical analysis of grapes. The consolidation of the two Bureaus has made possible closer teamwork between the chemists and engineers, a development of highest importance in bringing many of the results of research up to the stage of practical application on the farm and in industry.

The scope of the activities of the Bureau is indicated by the names of the various divisions and laboratories which include: Agricultural Chemical Research, Naval Stores, Allergen Investigations, Enzyme Laboratory, Protein and Nutrition, Farm Mechanical Equipment, Farm Structures, Mechanical Processing of Farm Products, and Rural Electrification Research. In addition, the Bureau now has four Regional Research Laboratories for investigations on the industrial utilization of farm products. These four laboratories, authorized by Congress, in the Agricultural Adjustment Act of 1938, are located at Wyndmoor, near Philadelphia, Pa., Peoria, Ill., New Orleans, La., and Albany, Calif. They are designed for studies leading up to development of new and expansion of present industrial uses of the principal farm commodities or their by-products.

The effectiveness of this Bureau in the interests of the farmer and the general population is best illustrated by a few examples of the results of recent research.

Citrus growers have received conspicuous benefits in recent years from the chemical research of the Bureau. It was learned that green-colored but fully ma-

ture tree-ripened oranges could be made uniformly yellow, and consequently more marketable, by using ethylene gas to bleach out green color associated with the natural yellow. This method, now in general use on certain varieties of citrus fruits, cost the taxpayers only about $4,000 for the research but is estimated to be worth about $4,000,000 a year to Florida growers alone.

The processes of deaeration and pasteurization have given great impetus to the production and marketing of canned citrus juices. Producers of other fruit juices for market are also beginning to benefit from this research. As a result of this work the annual pack of fruit juices has increased enormously. Indeed a new industry has been developed.

Some of the gay, fast colored cotton fabrics that men and women are wearing today are largely the result of research by Government chemists who developed new technical methods for the economical production of intermediates required for the manufacture of fast and brilliant dyes for cotton goods. This research, it is estimated, has expanded the uses of cotton for wearing apparel, drapes, etc., and increased returns to the cotton industry by several million dollars a year.

In the soybean laboratory at Urbana, Ill., progress has been made in the development of paints, varnishes and enamels from soybean oil, and plastics from soybean meal, which is the residue after the oil is extracted. Resulting, at least in part, from the work of this laboratory, substantial quantities of ready-mixed paints and enamels containing soybean oil are now sold widely. One paint company has made and sold more than a million gallons of soybean-oil paints. Other research has contributed to wider use of soybean meal and its protein in a variety of products, including plastics and adhesives.

The sweet potato gives promise of becoming an important industrial crop because the Bureau developed a process for extracting high-quality white starch from sweet potatoes. A growers' cooperative at Laurel, Miss., produced during the past season more than 3,000,000 pounds of sweet potato starch. Already the product is being used for sizing and finishing in cotton mills and by the laundry, baking and confectionery industries. More than twelve hundred co-operative farmers are participating in the benefits from the Laurel plant.

The development of a seed-cotton drier as a modern cotton gin accessory has brought great benefit within a few years to both cotton growers and ginners. As a result of the use of driers developed by the Bureau more than

1,000 of which have already been installed by gin owners, it is estimated that the bale value of damp cotton dried before ginning is increased approximately 70 cents for short staple and $2.50 for long staple. The drier makes it possible to increase the gin turnout of cotton, reduces breakage of the fiber, and therefore increases the average length of staple. Dry cotton is also more easily cleaned.

Phenothiazine, developed in the Bureau as an insecticide, is one of the most interesting chemicals brought to light in recent years. It has value as an insect killer, as a vermifuge for sheep, swine and horses, and as a fungicide. A public service patent covering the use of phenothiazine has been granted. The product of this research is not only helping farmers reduce the cost of combating insects and animal diseases, but appears to have great possibilities in combating bacterial diseases of the urinary tract in humans.

The steel plow was invented more than 100 years ago, but improvements are still being made. Some recent contributions to plow improvement have come from the Bureau, notably the self-aligning disk jointer, which enables the plow to cover cornstalks and other trash more thoroughly and cuts down the power requirement by 10 to 15 percent.

According to the results of research by engineers of the Bureau in co-operation with the New Jersey Agricultural Experiment Station, a stronger silo is required to hold grass silage than to hold corn silage. In general, silos have been designed for pressures of about 12 pounds per square foot of depth. In actual tests, corn silage with moisture content of 68% to 74% exerted average lateral pressure up to 14 pounds per square foot per foot of depth, whereas grass-and-molasses silage with from 72% to 78% moisture content produced average lateral pressures up to 19 pounds, which is approximately 50% greater than the usual silage pressure. The results of this co-operative research provide farmers with information on how much reinforcement is necessary when silos are to be used for grass or alfalfa silage instead of corn silage.

Recent improvements in potato-storage houses resulting from research in the Bureau make it possible to store potatoes, at least in the North where the tests have been made, with less rotting of the tubers and of the timbers in the storage house. Temperature and moisture are controlled mainly by conduction of heat and condensation of moisture on moisture-proof surfaces.

A vacuum-carbon dioxide oil-

ing treatment has been devised which keeps eggs in fresh condition for a considerable time during cold storage. It is much superior to other commercial methods of oiling shell eggs. Special equipment is now being made commercially for applying this vacuum-carbon dioxide oiling treatment. As a result of this new method fewer doubtful eggs should reach the breakfast table.

In studies intended to help in the design of fertilizer-distributing machinery, it was found that for many of the common crops it is best to place the fertilizer in bands about two inches to each side of the row and slightly below the level of the seed. However, seedlings of some crops are so sensitive to strong fertilizer solution in the soil that the placement must be farther away. Surprising increases in yield have been obtained with many crops with no increase in the amount of fertilizer but simply through proper placement of the usual amount. The results are now available to the public, and are being put to practical use by manufacturers of farm machinery.

Houses with high ceilings are not more comfortable in summer than those with ceilings of average height, according to the results of Bureau studies. Winter house tests showed that weather stripping, caulking, and the use of building paper under the siding saved from 15 to 45 percent of fuel.

The Bureau's work in many respects is well adapted to the solution of emergency problems brought on by defense needs. There are certain products and processes still under investigation but on which enough information has been acquired to enable the Bureau to prepare plans for production or operation on a considerable scale. Some of the things in this class are sweet potato starch, sweet potato production machinery, tanning materials, fiber flax, wool substitutes, rubber substitutes, gasoline substitutes, drying oils, frozen fruits and vegetables, dehydrated fruits and vegetables, sugar, sugarcane and sugar-beet production machinery and protection of grain and other products from explosion and fire losses.

In addition, the Bureau could provide much help in the fields of increasing food production in general for emergency needs, pharmacology, medicine, and production of plastics. There are chemists, engineers, and technicians in the Bureau who are well acquainted with processes and equipment needed in the production of materials used directly in warfare or for home defense.

# Modifying Biennial Bearing in Apples

Condensed from American Fruit Grower

*Dr. J. R. Magness and Dr. L. P. Batjer*

U. S. Horticultural Station, Beltsville, Md.

EXTENSIVE investigational work has shown that the biennial bearing habit in apples results from an excess of fruit setting on the trees during the "on" year. When the quantity of fruit on the tree in relation to the amount of foliage which the tree carries is excessive, flower-bud formation for the following year does not occur. Thus, in the season following the "on" year there is an absence of bloom and crop on the trees. Under these conditions excessive fruit-bud formation occurs with most of the growing points becoming flower buds. Once the biennial bearing habit is established, we have alternate years of extremely heavy bloom and heavy crop followed by an absence of bloom and absence of crop. Fruit thinning experiments have shown that, if the fruit set is reduced in sufficient amount and sufficiently early in the "on" year, fruit-bud formation will occur and repeated crops can be secured. Because of the very short time during which this thinning can be done, however, and the large number of fruits which must be removed from biennial trees, correction of the biennial bearing habit by hand thinning is a questionable economic practice under many growing conditions.

Experiments conducted in 1939 and earlier indicated the possibility of killing part of the bloom of apple trees by the use of caustic sprays such as tar oil distillate and di-nitro-ortho - cyclo - hexyl-phenol. All of the trees sprayed in 1939, in which the set of fruit was reduced to not more than one fruit per 10 blossom clusters in heavily blooming trees, formed a good crop of fruit buds and set good crops of fruit in 1940. Consequently, experiments were continued in 1940 to study the effect of different concentrations of these materials on set of fruit. Since the earlier work had indicated that the delayed cluster bud or early pink stage was most satisfactory for preventing fruit set, all the trees used in 1940

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were sprayed while in this stage.

A block of 13 year old York Imperial trees from 25 to 30 feet high and almost completely biennial were available for use at the University Experiment Farm, Kearneysville, West Virginia. These trees were sprayed at the early pink stage, using the spray materials, TOD (Tar of oil distillate), or DNO (a prepared mixture of dinitro-ortho-cyclohexyl-phenol in oil.) Check trees and treatments were used randomly throughout the block. Pollination conditions were good for all trees. As thorough coverage as possible of all the materials used was applied; one man spraying the trees from the top of a tank mounted on a truck, another spraying from the ground. On such tall trees it is necessary to direct the spray upward to reach the tops and, in general, hitting blossoms and subsequent killing are less complete in the tops of such tall trees than on the lower branches.

The yield of these trees for 1938 and 1939 indicated the degree of the biennial habit since no treatments were applied during either of these two years. Data was secured by counting 2000 or more blossom clusters on four large limbs in each tree, these limbs being distributed from the middle of the tree upward. Fruit set on these limbs was counted when the June drop was largely over. Additional data was obtained by collecting 100 spurs from all parts of each tree, practically all of the spurs being those that had blossomed in 1940 but had not set fruit. These were cut longitudinally and examined under a binocular microscope for flower parts. At the time these samples were examined, December 2-4, 1940, flower parts in the buds could be distinguished clearly. While such a small sample was not expected to be an accurate indication of total bloom in 1941, it was believed that the relative amount of bloom indicated for the various trees would be fairly close to what would develop.

Almost all growing points on these trees had blossomed in the spring of 1940. Check trees varied from 29 to 44 per cent and, as would be expected, apparently formed almost no fruit buds for 1941. Following those spray treatments which reduce the set to not over 10 fruits per 100 blossom spurs, there was apparently ample fruit-bud formation for a full crop in 1941.

In the experiments tar oil distillate at .8 per cent concentration appeared to be somewhat more effective in reducing fruit set than the same material at 1.6 per cent. We have no explanation of the failure of the 1.6 per cent tar oil distillate to more effectively reduce the set on the trees in the experiment sprayed only once

with this material. Other trees sprayed from the same tank mixture had their fruit set effectively reduced.

A treatment with tar oil distillate 1.6 per cent as a repeat spray represented two applications of this material made five days apart, the first being at the early pink and the second at the late pink stages. This treatment was applied to determine the possibility of completely removing the crop by such repeat sprays, a practice which, under some conditions, might be desirable from the standpoint of codling moth control. The repeat sprays on these very large trees did not completely prevent fruit set, apparently because of the difficulty of hitting all the blossoms in such large trees, even with two applications.

On these trees the DNO at dormant and half-dormant strength appeared somewhat more effective than the tar oil distillate in preventing fruit set. The half dormant strength was fully as effective as full dormant and, apparently, was strong enough to prevent the setting of any blossoms that were well hit.

It is interesting to note that eight of the ten sprayed trees apparently had ample fruit buds for a crop in 1941. Aside from the trees given a double application, these trees averaged about 10 bushels of fruit per tree in 1940, or about one-fourth of the maximum crop they produced in the "on" year of 1938.

Additional tests of these same materials on younger York Imperial, Stayman Winesap and Gano trees about 18 years of age, and which consequently could be thoroughly hit with the spray materials, were made. In these tests on York Imperial .8 per cent TOD and one half dormant strength DNO decreased the set to about one-third that of the check trees. The 1.6 per cent TOD and full dormant strength DNO reduced the set still more drastically while the tar oil distillate repeat spray resulted in almost complete removal of the crop. However, a few scattered apples remained on the trees.

With Stayman Winesap even .4 per cent TOD reduced the set to only about one-third of that on the checks. TOD .8 per cent was not appreciably more effective than .4 per cent. The .8 per cent repeat, however, removed practically all of the fruit. With Gano, on which many of the fruit buds are on relatively long shoots, the proportion of reduction was similar.

Younger trees of all three of these varieties were not fully biennial but had a heavy bloom in 1940. The results are indicative of the amount of reduction in set that might be expected from these lower concentrations of ma-

terials when applied to trees that can be covered thoroughly with sprays directed more or less horizontally into the tops rather than upward from below.

The results of the 1940 spraying substantiated those obtained earlier in indicating that tar oil distillate at .8 per cent concentration, thoroughly applied, is sufficiently strong to prevent the set of a large proportion of the fruit buds of all the varieties investigated. DNO at one half dormant strength appeared on the whole to be slightly more effective than TOD at .8 per cent in preventing fruit set.

Examination of the fruit-bud formation for 1941 on the old York Imperial trees indicated that, where not more than one fruit was set for 10 blossom clusters, ample fruit-bud formation for a crop for 1941 had been secured. This amount of reduction occurred in practically all cases where these materials were used. Objective in the spraying was to hit all buds. Fruit which set following the spray treatment was apparently from buds not sufficiently developed at the time of spraying to be thoroughly hit, or which were protected by branches or by their position on the tree, so that the spray material did not hit the actual buds. Even with a thorough job of spraying, it has not been possible under Potomac Valley conditions to remove completely the crop with one spray application.

During the past eight years in the United States, the even-numbered years have been relatively short apple crop years with much better prices prevailing than during the odd-numbered years. Many orchards, however, have been producing their main crop during the odd-numbered years with disastrous financial results to the grower. Treatments outlined indicate a method by which the "on" year for parts of such biennial orchards can be changed and by which orchard production as a whole can be made more uniform from year to year without the complete loss of a crop. It would appear to merit the serious consideration of any grower who has certain varieties in a strongly biennial condition. The grower might accomplish more uniform production through thoroughly spraying approximately half of each tree of biennial varieties, or by spraying all of the trees in a part of biennial blocks.

# Meat-and-Bone-Scraps for Hogs

Condensed from Hog Breeder

*D. W. Johnson and E. F. Ferrin*

AT the 1938 Minnesota Swine Feeders' Day the results of feeding tests, in which dry rendered tankage, wet rendered tankage, and meat-and-bone-scraps were compared as protein supplements in dry lot, were reported. Briefly, these tests showed that dry rendered tankage was a much better protein supplement than either of the other two feeds. However, it was shown, as has been shown elsewhere, that the wet rendered tankage could be made into a satisfactory supplement by mixing other protein supplements with it. Although such additions to dry rendered tankage gave no improvement in growth over dry rendered tankage alone, because of the possible variations in the offal used in its manufacture, there may be times when such additions are advisable. In these tests no attempt was made to find what supplements should be added to meat-and-bone-scraps in order to improve it.

Those engaged in the manufacture of these supplements have stated that eventually only dry rendered tankage and meat-and-bone-scraps will be produced and that probably the largest part of the production will be of the latter feed. Thus it is of interest to know how to make meat-and-bone-scraps into a satisfactory supplement for dry lot feeding conditions with the use of as few other supplements as possible. Then, too, since the above tests were conducted in dry lot, it is important to find if good pasture will satisfactorily supplement this protein feed.

Accordingly, during the summer of 1939 five lots of nine pigs per lot were fed for a period of 84 days. The lots, self-fed, free-choice, received ground corn, salt, and the following supplements:

Lot 1—Meat-and-bone-scraps

Lot 2—Meat-and-bone-scraps, 50 per cent; Soybean oil meal, 50 per cent

Lot 3—Meat-and-bone-scraps, 50 per cent; Soybean oil meal, 25 per cent; Alfalfa meal, 25 per cent

Lot 4—Same as Lot 1 plus rape pasture

Lot 5—Same as Lot 2 plus rape pasture

This experiment was repeated

Reprinted by permission from the Hog Breeder, Chicago, Ill., June, 1941

during the summer of 1940. In addition, two other lots were fed on rape pasture. These designated as Lots 6 and 7 in the table, received ground corn and salt. Besides these feeds Lot 6 was given dry rendered tankage and Lot 7 dry rendered tankage, 50 per cent, plus soybean oil meal, 50 per cent. These two rations were self-fed, free-choice.

The results of these tests are shown in the table. The lighter initial weights of the pasture fed lots are due to the fact that the pasture fed pigs in the 1940 test were not as old as the pigs fed in dry lot. The slowest gaining lots were Lot 1, receiving a supplement of meat-and-bone-scraps, and Lot 4, receiving the same supplement on pasture. While the pasture resulted in some improvement in growth of the pigs, it is obvious that it did not entirely supplement the meat-and-bone-scraps. When one-half of the meat - and - bone - scraps was replaced with soybean oil meal (Lots 2 and 5) marked improvement in the growth of the pigs resulted. The fact that the pasture fed pigs in Lot 5 gained somewhat faster than those without pasture in Lot 2 may be due to the sore footedness of some of the pigs in Lot 2 as a result of being housed and fed on concrete. This sore footed condition was also present in some of the pigs in the other groups fed in dry lot.

The alfalfa meal as one-fourth of the supplement (Lot 3) resulted in no better growth than when only soybean oil meal was added to the meat-and-bone-scraps. Under winter feeding conditions, however, the alfalfa would furnish needed Vitamin D. It is apparent from the gains of Lot 6 that the dry rendered tankage was a satisfactory single supplement. The fact that Lot 7, receiving equal parts of dry rendered tankage and soybean oil meal, gained somewhat less rapidly than Lot 6 should not be construed to mean that a mixture of the two supplements is not as satisfactory as dry rendered tankage alone. It merely means that there were a few unusually fast gaining pigs in Lot 6 even though an effort was made to have the two groups as uniform as possible at the start of the experiment.

It is of interest to note that the pigs on pasture required approximately twice as much salt as those fed without pasture. This has been demonstrated many times here and at other experiment stations. Thus, while it is important to feed salt to hogs at all times it is particularly so when they are on pasture or when receiving protein supplements of vegetable origin.

Meat-and-bone-scraps, as the only protein supplement to corn and salt for young growing pigs,

## IMPROVING MEAT-AND-BONE-SCRAPS AS A PROTEIN SUPPLEMENT FOR HOGS

(An average of two* 84-day feeding tests with 16 pigs per lot)

| Lot | Ration | Average initial wt., lb. | Average final wt., lb. | Average daily gain, lb. | Average daily ration, lb. | | | Feed eaten per 100 lb. gain, lb. | | | | Feed cost per 100 lb. gain** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Corn | Protein supplement | Salt | Corn | Protein supplement | Salt | Total | |
| 1 | Ground corn; meat-and-bone-scraps; salt | 53.79 | 148.64 | 1.13 | 3.39 | 0.88 | 0.005 | 300.00 | 77.88 | 0.44 | 356.19 | $4.75 |
| 2 | Ground corn; meat-and-bone-scraps ½, soybean meal ½; salt | 54.92 | 178.06 | 1.47 | 4.29 | 0.90 | 0.006 | 291.84 | 61.22 | 0.41 | 353.47 | 4.07 |
| 3 | Ground corn; meat-and-bone-scraps ½, soybean meal ¼, alfalfa meal ¼; salt | 54.95 | 172.69 | 1.41 | 4.10 | 0.82 | 0.005 | 290.78 | 58.16 | 0.35 | 349.29 | 3.98 |
| 4 | Same as Lot 1 plus rape pasture | 48.62 | 157.19 | 1.29 | 4.37 | 0.44 | 0.012 | 338.76 | 34.11 | 0.93 | 373.80 | 4.86 |
| 5 | Same as Lot 2 plus rape pasture | 47.65 | 182.53 | 1.60 | 5.10 | 0.60 | 0.01 | 318.75 | 43.13 | 0.63 | 362.51 | 4.56 |
| 6 | Ground corn; dry rendered tankage; salt; rape pasture | 45.09 | 179.81 | 1.60 | 5.46 | 0.43 | 0.01 | 341.25 | 26.88 | 0.63 | 368.76 | 4.68 |
| 7 | Ground corn; dry rendered tankage ½, soybean meal ½, salt; rape pasture | 44.94 | 171.57 | 1.51 | 4.41 | 0.59 | 0.01 | 292.05 | 39.07 | 0.66 | 331.78 | 4.25 |

*Lots 6 and 7 represent only one test with seven pigs per lot.

**Prices used: Corn, 56c per bu.; meat-and-bone-scraps and dry rendered tankage, $45 per ton; soybean oil meal, $30 per ton; alfalfa meal, $14 per ton; pasture, 25 cents per month per pig.

while at times giving better growth than at other times, has not been a satisfactory feed either in dry lot or with rape pasture. Better growth, however, has resulted with pasture than without. The use of a mixture of equal parts of meat-and-bone-scraps and soybean oil meal gave excellent results with or without pasture. Using alfalfa meal as one-fourth of a mixture containing one-half meat-and-bone-scraps and one-fourth soybean oil meal gave no better results than an equal mixture of the latter two feeds. With pigs on rape pasture dry rendered tankage was as satisfactory as a mixture of equal parts of tankage and soybean oil meal. This could be expected from the good gains usually obtained from dry rendered tankage in dry lot.

In buying protein supplements it should be remembered that meat-and-bone-scraps contains 50 per cent protein as compared to 60 per cent for dry rendered tankage. This means that it should be purchased for about 83 per cent of the price of tankage. For example, if tankage is priced at $45 per ton, then for meat-and-bone-scraps to be as economical a supplement it should be priced at about $37.35 per ton.

## Baby Pig Disease

An unidentified, sporadic, and highly fatal disease of baby pigs was studied by Graham and associates at the University of Illinois. Litters normal at birth developed symptoms of shivering, dullness, failure to eat, rough hair coats, and a weak squeal within 24 to 48 hours. From five to 95 percent of litters were affected. Research tests eliminated bacteria and viruses as the cause.

Chemical studies of the blood indicated that the blood-sugar level was constantly lower in pigs affected with "Baby Pig Disease," a condition technically known as hypoglycemia. The diseased pigs averaged 26 milligrams of sugar per 100 cc. of blood. Normal pigs averaged 113 milligrams of sugar per 100 cc. of blood.

Pigs in the early stage of the disease showed improvement in two to four hours after receiving dextrose. Repeated doses of dextrose and milk prolonged the life of sick pigs and saved some. The evident preventive measure is to be sure that brood sows receive a high sugar intake during the latter phase of pregnancy.

—*Successful Farming*

# Bale-Chute Saves Labor

**Condensed from New Jersey Farm and Garden**

***D. M. Babbitt***

WILLIAM H. WAGNER, of Flemington, got tired of seeing needless hours of muscle-straining work go into a task which he believed could be done by a machine just as satisfactorily and at less cost. So he planned and built a bale-chute much along the lines of the ice cake chute formerly used at large ice houses on the shores of lakes and ponds when natural ice was stored in huge quantities.

Mr. Wagner, by using his head, merely harnessed the energy used by the baler to press the bale and expel it from the machine to shove the bales up an incline into the top of the mow. The pressure of the twelve or thirteen bales going up the incline takes the place of the pressure formerly put on the baler to compress the bale. At least three men formerly tugged and strained to pass the bales up into the mow. Now the bales pass up automatically as they are shoved out of the baler, and one man at the top of the incline directs them down a two-plank slide to the place they belong in the mow. As the mow becomes full two men are needed to do this job.

The contraption required only a little time to build, according to the "inventor." The parts and pieces will be put aside, and very little time will be required to install the chute another year. It was built out of lumber which Mr. Wagner had available around the farm. A few extra blocks were required and these were built by home labor out of home-sawed material. The blocks drop out automatically as the bale reaches the top of the incline, and is pulled away from the chute. The block automatically drops down to a lower chute and returns to a position near the machine where the attendant can pick it up easily and put it in place.

Not only is this device used in connection with the thresher and baler combination, but Mr. Wagner has also tried it with loose hay. He brought the loose hay from the field and, instead of unloading it into the mow, pitched it off onto the hay press table and the mowing job was then practically done.

This is just another illustration of the inventive genius that takes much of the drudgery out of farm work, and at the same time saves labor which is hard to find.

Reprinted by permission from New Jersey Farm and Garden, Sea Isle City, N. J.

# Planning a Nut Orchard

From the book, "Nut Growers Handbook"

*Carroll D. Bush*

A grower starting the commercial growing of nuts should plan to make the little trees he sets out into big trees that will produce in as few years as possible. Experts advise that the location should be studied with care. But if the grower already has the land and wishes to plant nut trees or start with the idea of saving soil or of growing trees where nothing else will do well, or of building a profitable wood lot, he will merely try to find out if nut trees will grow in the location and in the soil he has. Most of us cannot pick our soils and locations. We merely wish to know if we can grow the trees on the land we have.

In the Northwest, C. E. Schuster has been working in connection with the Oregon State College trying to find out all that it is possible to know about soils for deep rooted trees like walnuts, chestnuts and pecans.

He and his co-workers lay the greatest emphasis upon the ability of soils to retain a large amount of water. We have known, as any farmer knows, that good water-retaining soil contains a large amount of vegetable matter. Sandy soils retain little moisture, clay soils are some better but our loams are better than other soils in this respect.

It has been found that soils must be such as will readily give up their moisture to plants. Certain types retain considerable moisture but plants cannot take it to the extent that they can from other soils.

Again, it has been found that roots need air. Hard, compact soils, as some clays with little air in them, cannot be penetrated by tree roots no matter what may be their chemical analysis. Considerable sums have been lost in attempts to grow orchards on too compact soils. The minimum amount of air that should be in a soil is regarded as five percent. Ten or twelve percent of air is found in good growing soil but when there is much more than that the soil becomes too porous and dries out easily.

In the West we are told to use a soil augur to a depth of ten feet before a nut grove is set on any land. It would be nice to have

Reprinted by permission from the book "Nut Growers Handbook"

ten feet of rich soil, but lots of big forest trees have less. If a soil has already been penetrated by tree roots it is an indication of a good tree soil. It is to be emphasized that the subsoil of tree land is as important as the surface soil. One of the tests for a good subsoil is the using of it for growing plants. If a little of the subsoil is put in a pot with sunflower seeds and the plants continue growing after the first two leaves are out, it is a good growing soil. If the sunflower grows the first two leaves from the seed and then stops or dies, that soil lacks what it takes to make a tree. However, this soil test fails when used on soil that lacks air. Soils that are too tight may grow good plants when put in pots but will not allow the penetration of tree roots where they lie under the ground.

Just as limbs reach for light, so the roots of trees will reach for water and food. The roots will be the most luxuriant in the best soils. In many soils most of the feeder roots of a tree are near the surface, but in rich subsoils the lower feeder roots are also numerous.

The action of roots that grow in water and are fed with chemicals gives us a further idea of how roots work. In some foreign greenhouses tomato plants are said to reach the height of ten feet though grown in 3-inch pots. Tree roots, like roots of other plants, will be much smaller and more compact where there is plenty of food and moisture than where the land is dry and the food limited. We cannot grow walnut trees in 3-inch pots but there is an analogy.

River bottoms, though soil is shallow, may raise good nut trees. The overflowing of the land each year fertilizes them with silt and helps their growth. But the land needs to be well drained most of the year for only certain species of trees are adapted to boggy lands. Because a tree will send its root 30 feet in the ground does not mean that it needs that depth. The depth of soil advocated by some soil students is without question much more than is really needed, where there is plenty of moisture and food in the soil. More often than anything else, moisture is really the limiting factor in tree growth. Food passes into the trees with water. Plenty of food in the soil aids growth but a tree cannot use the food without moisture to dissolve the food and carry it into the roots.

There is a limitation, too, in the roots of different varieties of trees. California black walnuts will use, and almost demand a deeper and dryer soil than can be used by the eastern American black or the English walnut. Butternut trees have flat spreading

roots adapted to the shallow, rich soil of creek bottoms. Japanese walnut roots are much like the butternut root but go a little deeper. The American chestnut is deep-rooted but the Japanese has a more spreading and fibrous root, due perhaps to its being native of a rainy country. The Chinese chestnut, native of a dry interior country, has a deep root. With so many factors to consider, it is impossible to make a hard and fast rule about depth for a nut grove. Three feet of rich soil may be better than twenty feet of poor soil with shallow rooted trees.

Wherever possible, growers should select frost-free locations for trees. Early blossoming trees like walnuts, pecans, hickories and almonds will be injured by late spring frosts. The chestnut is a late bloomer (Blossoming in Oregon in June), so should not ordinarily be in any danger from frost injury. Filberts bloom when we have frosty nights without damage but in the eastern part of the United States growers are warned not to plant in sunny locations as they may be coaxed into bloom in warm winter weather and caught by the heavier freezes later. Where there is danger of frosts, hill slopes with air drainage and locations adjacent to water are preferred for grove planting.

## REVIEW

*NUT GROWERS HANDBOOK by Carroll D. Bush (Orange Judd Publishing Co.), $1.75, discusses the growing of chestnuts, filberts, hazels of other varieties, English and black walnuts, pecans, and other hickories, almonds, pistachios, pine, acorns and chinquapin nuts. There are chapters on the planning of a nut orchard, its pruning and planting, topworking of the trees, and the harvest and care of the nuts. During the past 30 years, a great deal of work has been done on improving varieties of trees, the care of the trees, and the care and marketing of the nuts. This information is set forth in a chatty style which makes the book pleasant reading, but does not detract from it as a source of information. Many references are included where facts not covered by the book may be obtained. The Nut Growers Handbook will be useful to the man who knows little about nuts, but is thinking of planting a grove, or to the man who wishes to plant a few trees about his place, and it will be useful to the experienced grower as a handy reference book.*

# Grades Versus Crossbreds

Condensed from The Cattleman

*F. W. Bell*

Professor of Animal Husbandry, Kansas State College, Manhattan, Kansas

LIVESTOCK as to kind may be grouped in four general classes as follows: 1. Purebreds, 2. Grades, 3. Crossbreds and 4. Scrubs.

Anyone who expects to make a profit from livestock raising should cut out all scrubs. The very name "scrubs" suggests inferiority and no one can expect a profit from marketing inferior livestock. Quality is the opposite of inferiority, and quality in any commodity always commands a higher price. Livestock producers must sell their animals at the prevailing market price, and a low market price always prevails on scrub livestock.

Good purebreds represent the top in price, but that doesn't mean that purebreds are most profitable for producing market livestock. Of course purebreds make good market animals, but their cost is too great to allow the producer to make a profit by marketing all the increase of a purebred herd for slaughter. The aim of the purebred breeder is not the production of commercial livestock directly from his herd, but rather to provide breeding stock to be used for the improvement of market stock. This is done chiefly through furnishing purebred sires for grading up commercial herds.

Using purebred sires on common females produces grades. Continuing the use of purebred sires of the same breed for several generations gives us high grades. Crossbreds are the result of mating a purebred sire of one breed with purebred dams of another breed. Either method of breeding, in one case high grades, and the other crossbreds, produces good market stock.

Before we make a decision as to the breeding program we plan to follow, we should have in mind some objectives which if attained will give us greater returns. Among such objectives should be:

1. Maximum rate of gain
2. Lowest cost of gains
3. Highest selling price
4. Breeding methods which will result in continued improvement of the herd

These factors combined in livestock production give us a greater

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margin of difference between cost of production and selling price, therefore, a greater margin of profit. Rate of gain is dependent on two factors, which are good health and feeding ability. In other words for rapid gains livestock must utilize large amounts of feed, and they must be thrifty in order to maintain maximum rate of gain.

Cost per pound of gain is closely related to rate of gain since it is invariably true that fast gainers make their gains at less cost per hundred weight. This is logical because no increase in weight is made until maintenance requirements are met, and all feed above maintenance is converted into increase in weight. Also cost of gains depends largely on cost of the daily ration, hence a well balanced ration made up of less expensive feeds will lower the cost of production.

Selling price per hundred weight is determined by quality of the product, dressing percentage, live weight of the animal, and age. Quality of the product is largely determined by breeding and degree of finish. Dressing percentage is determined by condition and amount of waste.

Now let us consider the probability of achieving the desired results by one of two different methods of breeding, either by cross-breeding or grading up. The opinion is quite commonly held that crossbred animals are more vigorous and stronger than either purebred or grades. The assumption is that if two breeds are crossed the offspring have more vigor than either purebred, thus giving us thriftier animals which make faster gains. There is some justification for this belief. We know that some of our purebreds are too fine, they don't have enough bone and they lack somewhat in ruggedness and hardiness. When this is true crossing purebreds is very likely to restore natural thrift and vigor. But why let our purebreds become too fine and delicate? If we give the same attention to selecting for strength and ruggedness in purebreds that we do to smoothness and perfection of form, there is no reason why we cannot maintain full vigor along with the other desirable characteristics of purebreds.

It is true that too much emphasis in quality and smoothness sacrifices bone and size. This is a fact, but not a necessary evil, to be accepted in purebred livestock. But if we do overlook ruggedness in selection, this lack of ruggedness will become fixed in purebreds just as any other features become strongly fixed and strongly transmitted.

Are there any objections to crossbreeding? Keeping in mind that livestock improvement is a progressive process of adding improvement to each succeeding

generation, we know we cannot carry on with a crossbred breeding herd. If we do, most anything can happen. The offspring of crossbred parents will vary in every way, type, color, size and conformation. We get into all kinds of trouble if we use crossbred breeding stock. To practice crossbreeding successfully we must either keep two herds of breeding stock or buy replacements in order to continue the practice.

On the other hand grading up is a method of breeding that results in steady improvement. We retain the best young females for replacements, and purchase a new sire of the same breed as needed. By selecting a better purebred sire each time we raise the average value per head of each generation. We build up a breeding herd which has practically all the advantages of a good purebred herd without the expense necessary to maintain a purebred herd.

Grading up commercial herds by continued use of good purebred sires is the best way to raise the average value of market cattle. It is the practice followed by successful livestock raisers. This system is the basis of the large commercial herds of beef cattle, and is the method followed by good dairymen, as well as sheep and hog producers. It always works if careful attention is given to the fundamentals of livestock improvement which are:

1. Health and vigor, necessary for consistent rate of gain and economy of production.

2. Size, which is the principal factor determining rate of gain.

3. Correct type, which determines the ability of meat animals to finish at the desired market weight and age, and to yield carcasses which best meet market requirements.

## Acetonemia of Dairy Cows

The immediate cause of acetonemia or ketosis of dairy cattle seems to be a carbohydrate deficiency. Most common symptoms are constipation, reduced milk flow, and nervousness. The condition is frequently mistaken for impaction of the paunch. Recovery is often slow. Research shows that many of the symptoms, especially those of nervous type, are due more to depleted blood sugar than to presence of ketone bodies. For this reason, treatment is based on the injection of large amounts of dextrose directly into the bloodstream.

—*Successful Farming*

# Trichomoniasis in the Pure Bred Herd

**Condensed from Holstein-Friesian World**

*Dr. Ray Klussendorf*

MUCH has been said and written about the Trichomonad and its activities. Trichomonad disease is caused by an animal so tiny that it is composed of a single cell; and it can be seen only through a microscope.

This infection is carried to the bull by an infected cow and then is carried by him from cow to cow at the time of service. It spreads very seldom, if at all, in any other way. Trichomonad disease appears in a herd following the arrival of a new bull, following service of an infected cow from another herd, or following service of a cow previously infected by service outside the herd.

Possibly the best way to help you recognize this disease when you encounter it will be to name some of the conditions that may be observed in a herd that has just been infected.

One of the first things that may be noticed is that cows will discharge after service. This is not always true, but it is often the first irregularity noticed; and it may point to a certain bull when a herd is large enough to be using several bulls.

Another early sympton is that cows often show irregular heat periods. A cow will pass over a heat period, and may then come in heat at almost any interval from 30 days to 100 days. Such a cow will be considered normal and pregnant when she goes over her heat period; and there will be no suspicion of trouble until heat periods recur. It is highly probable that most of these cows do conceive; but the fetus dies in a comparatively short time and is expelled from the womb.

A more noticeable and a more alarming evidence of trouble will be the fact that cows lose their calves before the middle of pregnancy. Very often the abortion occurs so early that it passes unnoticed, in which case the condition is likely to be classed as sterility rather than as abortion.

One other condition occurs, but may go unnoticed unless there is a careful examination of each cow; or, still better, a periodic check on the reproductive organs of each cow in the herd. In some

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cases the dead fetus is not expelled, but remains in the uterus and slowly decomposes. When this happens considerable quantities of pus usually accumulate in the uterus, and this condition we call pyometra.

Some herds will show only one or two of the conditions we have mentioned, others will show them all. Some herds will reveal the presence of trouble in only a portion of the females, while other herds will have practically all of the females involved. In almost every infected herd some cows will calve normally and at full term.

The bull shows nothing in most cases, although he is easily the most important factor in spreading Trichomonad infection. There is almost no change in his actions, and so little change in the appearance of any of his organs that these can not be readily recognized even on careful examination. Usually these changes occur soon after he becomes infected, and then they disappear entirely before enough cows show irregularities which lead to examination of the bull.

The word control is used advisedly, because there is no satisfactory treatment for either the bull or the cow that is infected.

When fighting any animal disease it is essential that we have an accurate diagnosis, which is only the professional way of saying that we must know exactly what condition is the real cause of trouble. Correct diagnosis is the basis of any successful fight against disease.

Let's trace the steps which will tell us definitely whether or not Trichomonad disease is present in a herd in which the reproductive history has not been satisfactory. This can be done only when the veterinarian is in the barn and ready for work; and when he has the breeding records for each cow right at hand.

Begin with a cow at each end of the line and then study the notes on her service calendar:—When was she fresh? Did she expel the fetal membranes promptly? How long did she discharge? On what dates was she in heat, bred? To what bull? Did she discharge?

As you answer these questions for each cow your veterinarian must carefully examine the reproductive organs of that animal. Notes on his findings are added to the record. If they are in accord with your record all is well, but when the two do not agree something must be amiss; and it is up to the veterinarian to determine what and where.

If a cow is showing a discharge of pus after service or after a heat period at an irregular interval such pus is examined under the microscope. It is well to make an examination right in the barn,

and then save some of the material for more careful study later on. If the case is of recent origin Trichomonads may be abundant, but in a case of several days' standing there may be few Trichomonads even when they are the cause of trouble.

When a cow that was presumably several months along in pregnancy proves instead to have developed a case of pyometra, some of this accumulated pus should be removed and examined under the microscope. Such material, freshly obtained, is usually our very best basis for a positive diagnosis; because many times it is almost a solid mass of wiggling organisms.

Sometimes additional information can be acquired from a study of cervical swabs made from heifers bred 10 to 20 days previously.

Trichomonad disease does not respond to treatment, so that the control program must be such that it will prevent spread within the herd and will take full advantage of the blood-lines still available. When it has been definitely established that the herd is infected, lose no time in taking steps to get it under control.

Divide the herd on the basis of the information presented by the breeding record and by the examination of the organs. Decide for each cow in the herd whether she should be considered:—1. Probably clean, 2. Exposed, 3. Probably infected, or 4. Definitely infected.

Probably clean includes all of those females that have an entirely satisfactory record, including absence of service to a bull after he has served any female in any of the other groups.

Exposed includes all those females that have been bred to a bull after he has served a cow in either of the two following groups; even though there has been no evidence (as yet) that infection was transferred by such service.

Probably infected covers those cows in which there is a history of service to an infected bull followed by discharge after service, irregular heat periods, early abortion, or other unsatisfactory breeding history; but from which cases Trichomonads have not been obtained.

Definitely infected takes in that group of cows from which pus or swabs have been taken; and Trichomonads have been seen from microscopic examination of such specimens.

A bull remains "probably clean" so long as he serves only females that would be classed as "probably clean" at the time of such service; he becomes "exposed" when he has served any cow after she classes as "exposed" or "infected"! A bull is classed "probably infected" when, ap-

parently as a result of his service, a cow develops any of the irregularities which classify her as "probably infected." He is "definitely infected" when Trichomonads have actually been recovered from his sheath or from the organs of any cow, apparently as a result of his service.

So far as possible, the breeding program should aim at the mating of a male with females in his own class or group. A "probably clean" bull should be mated only with females that are "probably clean"; except that where artificial insemination is practiced, semen from this bull may be used on any cow in the herd.

An "exposed bull" should serve only "exposed" cows; except that his semen may be used to inseminate any cow "probably infected" or "definitely infected."

A bull "probably infected" should be used on cows similarly classified; but "definitely infected" cows may be inseminated.

A "definitely infected" bull may be mated with cows "definitely infected"; and a surprising number of such matings result in prompt conception and normal pregnancy terminating in a live calf. Cows apparently develop some degree of protection from an attack of Trichomonad disease; at least cows that have once been infected can often be bred right back to the same bull that infected them originally and still maintain a normal reproductive cycle. There still is some question as to the safety of assuming that such cows are free from the disease, so that the safe plan for the time being is to consider the cow no better than the lowest classification she has ever been in.

The semen from a "definitely infected" bull can not be used with uniformly satisfactory results on any other group of cows; nor should the semen from a "probably infected" bull be used on the "exposed" or on the "probably clean" cows.

The general rule is that for natural service the male and the female should be classified the same, otherwise there is danger of infecting a bull by contact with diseased cows, or else danger of infecting a considerable number of cows by service to the diseased bull. For inseminations without natural mating the general rule is that semen may be used on any cow in the same class with or in a lower class than the bull himself; but that semen, even without natural service, can not be used safely on a cow in a higher class than the bull.

When a herd is not so large as to justify using four bulls the cows "definitely infected" and those "probably infected" may be bred to the same bull; the "exposed" females to a second bull; and the "probably clean" females to a "probably clean"

bull. If only two bulls can be used then the "exposed" females should be held over until they can be more definitely classified as "clean" or as "infected"—and mated accordingly. When only one bull is to be used in a Trichomonad-infected herd it is essential that he be a clean bull. He may be mated naturally with "clean" cows, but must be mated with no other females—the remaining members of the herd to be inseminated without natural mating.

The use of the infected sire is limited by the number of infected females in the herd; and present information indicates that only rarely does a bull recover from the infection. Sexual rest and strenuous programs of treatment probably do not improve the chances.

The use of the clean sire is limited by the number of clean females in the herd; or by the availability of artificial insemination.

The problem, then, of controlling and overcoming Trichomonad disease in a pure bred herd boils down to these major steps:

Recognizing the disease—diagnosis. The bull spreads it but shows nothing. Cows may discharge after service, show irregular heat periods, lose their calves, develop pyometra, or calve normally.

Finding the Trichomonad—clinching the diagnosis. The record of each cow must be studied at the time her reproductive organs are being carefully examined. Examination of pus is more likely to give a positive microscopic answer than is the examination of swabs.

Dividing the herd—males as well as females. Four groups may be used — Probably clean, Exposed, Probably infected, and Definitely infected.

Outlining and following a strict breeding program. Mate clean females with clean males, and infected females with infected males. When using insemination clean semen may be used on infected as well as on clean cows.

## FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

**Beef Cattle**—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

**Beekeeping**—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

**Breeding Your Own, or Raising Colts for Pleasure and Profit**—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

**Conservation in the United States**—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

**Dairy Cattle and Milk Production**—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

**Electricity in the Home and on the Farm**, by Forrest B. Wright ($2.75). Published by John Wiley and Sons, Inc.
(See Farmers Digest, November, 1941)

**Feeds and Feeding**—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

**Farm Meats**—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

**Farm Records**—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

**Forestry in Farm Management**—By R. H. Westveld, and Ralph H. Peck, John Wiley and Sons, Inc. $3.00.
(See Farmers Digest, September 1941)

**Fruit Crops**—By T. J. Talbert, Prof. of Horticulture, Univ. Mo., and A. E. Murneek, Asst. Prof. Horticulture, Univ. Mo. Lea and Febiger. $3.75.
(See Farmers Digest, June, 1941)

**Hunger Signs in Crops**—Published by the American Society of Agronomy and The National Fertilizer Review. $2.50.
(See Farmers Digest, October, 1941)

**Judging Dairy Cattle**—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

**Livestock and Poultry Diseases**—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

**Livestock Judging Handbook**—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

**Poultry Husbandry**—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

**Pork Production**—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

**Poisonous Plants of the United States**—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

**Poultry**—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry, Mo. State Univ. J. B. Lippincott Co. $4.00.
(See Farmers Digest, November, 1941)

**Plant Ecology**—By W. B. McDougall, Regional Biologist, Santa Fe, New Mexico. Lea and Febiger. $3.00.

**Sheep Production**—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

**Soil Conservation**—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

**The Nutgrowers Handbook**—By Carroll D. Bush (Orange Judd Publishing Co.). $1.75.
(See Farmers Digest, January, 1942)

**Vegetable Crops**—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

**The Western Horse**—Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

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# Scholarship Prize Contests

## To 4-H Club Boys

The Farmers Digest is offering a one hundred dollar ($100) scholarship to the winner of the 4-H Club Prize Contest.

This contest is open only to boys who are members of a 4-H Club and who will graduate from high school by July 1, 1942.

The contest closes January 1, 1942.

For complete contest rules refer to recent issues of the Farmers Digest.

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## To F. F. A. Boys

The last Prize Scholarship Contest sponsored by the Farmers Digest was open to F. F. A. boys and was won by Dean Parish, Manteca Union High School, Manteca, California.

The current contest, which closes January 1, is open to 4-H Club boys. The next contest will be open to F. F. A. boys.

**Watch for Details!**

**Perhaps you will be the winner!**

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The Johnson Press, Ambler, Pa.

# The Farmers Digest

## Presents Each Month Facts about Some Outstanding Agricultural Magazine

**New England Homestead** is more than just another farm paper to tens of thousands of New England farm families—it is a "New England Institution."

Founded in 1855, **New England Homestead** has been serving the interests of New England farm folks down through the changing years in a manner that has endeared it in the hearts of these sturdy farm people. That the Homestead has done its work effectively is best evidenced by its growth in editorial influence and its greater circulation. At the present time its circulation of close to 115,000 paid subscribers is the largest in its history. Eighty-four percent of Homestead readers live on R. F. D.'s or in towns under 2500 population.

Editorially the Homestead's primary purpose is to assist farmers and their families in putting upon a sound basis both agriculture as an industry and the rural home as an attractive life.

Mr. James G. Watson, well known among breeders and farmers, is President and Editor. Lucile W. Small, trained in home economics, is Household Editor. The publication office is at Worthington Street, Springfield, Massachusetts. Subscription price is 60 cents a year or two years for $1.00.

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